UARY, 1959

CHNOLOGY DEPT.

RUBBER WORLD

SERVING THE RUBBER INDUSTRY SINCE 1889

ts, page 488

PUBLIC LIBRARY
JAN 21 1959
DETROIT

d Mrs. Litchfield
on Dinner Honoring
an of the Rubber
ry on Retirement
page 567

LL BROTHERS
LICATION

PROPERTIES OF ELASTOMERS UP TO 500° F.
By F. M. Smith, page 533

Grains or powder, you always get top quality with

DU PONT THIURAM ACCELERATORS

TETRONE A
Dipentamethylenethiuram tetrasulfide

THIONEX
Tetramethylthiuram monosulfide

THIONEX GRAINS
Tetramethylthiuram monosulfide

THIURAM E
Tetraethylthiuram disulfide

THIURAM E GRAINS
Tetraethylthiuram disulfide

THIURAM M
Tetramethylthiuram disulfide

THIURAM M GRAINS
Tetramethylthiuram disulfide

DU PONT
REG. U. S. PAT. OFF.

RUBBER CHEMICALS

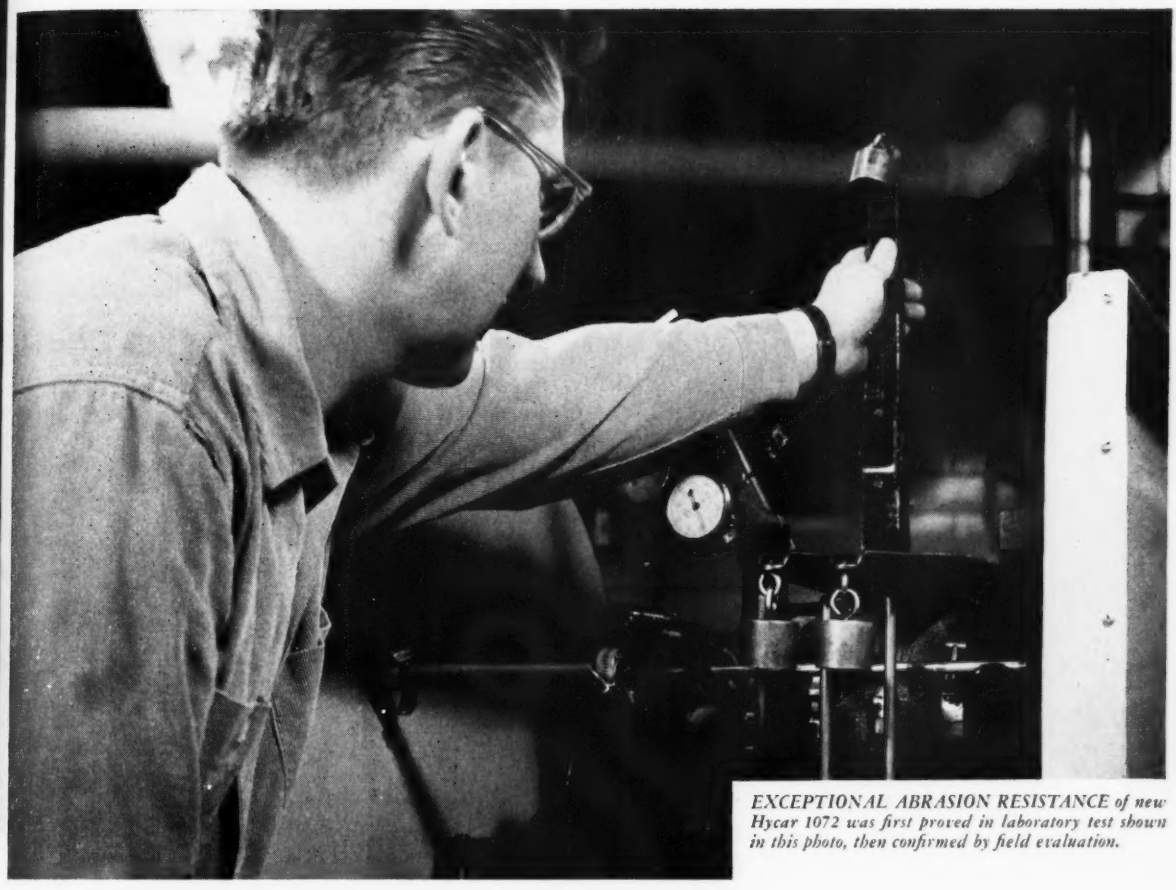
Elastomer Chemicals Department
Wilmington 98, Delaware

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

RUBBER WORLD, January, 1959, Vol. 139, No. 4. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 3rd & Hunting Park Ave. Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U.S.A. Second Class Postage Paid at Philadelphia, Pa. under the act of March 3, 1879. Subscription United States $5.00 per year; Canada $6.00; All other countries $7.00. Single copies 50¢. Address Mail to N. Y. Office. Copyright January, 1959, by Bill Brothers Publishing Corp.

News about

B.F.Goodrich Chemical *raw materials*



EXCEPTIONAL ABRASION RESISTANCE of new Hycar 1072 was first proved in laboratory test shown in this photo, then confirmed by field evaluation.

Gives outstanding abrasion resistance

HYCAR 1072

FINISHED parts made with Hycar 1072 have from four to ten times the abrasion resistance of parts made with typical nitrile rubbers. Gum tensile strength is unusually high. Ozone resistance is exceptional.

Hycar 1072 retains its good physical properties at elevated temperatures. High hardness and excellent physical properties can be obtained without the excessive loading that might otherwise interfere with good processing.

For further information on properties of Hycar 1072, write Dept. **KB-1,** B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
Reg. U.S. Pat. Off.
Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

RUBBER WORLD

Publisher
B. BRITTAIN WILSON

Editor
ROBERT G. SEAMAN

Technical Editor
RICHARD S. WALKER

Managing Editor
S. R. HAGUE

Assistant Editor
RICHARD E. WENING

Foreign Editor
L. THAKAR

Production Manager
M. A. LARSON

Circulation Manager
M. J. McCARTHY

Editorial
Advisory Board
JOHN J. ALLEN
JOHN BALL
P. D. BRASS
B. H. CAPEN
WALTER S. EDSALL
J. H. FIELDING
S. D. GEHMAN
LOUIS H. HOWLAND
GERARD W. KUCKRO
EDWIN B. NEWTON

BUSINESS STAFF
ROBERT L. MILLER
Eastern Sales Manager

JOHN P. GIUNTA
Eastern Sales Representative
630 Third Avenue
New York 17, New York
YUkon 6-4800

WILLIAM T. BISSON
Midwest Sales Manager
163 West Exchange Street
Akron 2, Ohio
FRanklin 6-3434

MARIE BERUBE
Representative
333 North Michigan Avenue
Chicago 1, Illinois
STate 2-1266

ROBERT E. AHRENSDORF
Representative
3275 Wilshire Boulevard
Los Angeles 5, California
DUnkirk 2-7337

ARTICLE HIGHLIGHTS

COMPREHENSIVE STUDY ON HEAT RESISTANCE

A study made on 19 compounds of several currently available elastomers to determine high-temperature serviceability shows a direct comparison of the effects of heat up to 550° F. and provides a practical yardstick for elastomer selection. **533**

VINYL FOAM BY PLASTISOL TECHNIQUES

Vinyl foam may be manufactured from poly(vinyl chloride) resin by plastisol tecniques. The compounding, processing, and manufacture of vinyl foam are reviewed, and the effects of plasticizer concentration on load deflection and of coring on a seat cushion pad are discussed. **542**

MORE ON STATISTICAL METHODS

Continued is the article from last month on the use of statistical methods to help a company balance more effectively the factors of quality and costs. **547**

BETTER BUSINESS STATISTICS NEEDED

Business management in the rubber industry needs better and more readily available business statistics from both government and its trade association. RUBBER WORLD urges the RMA to review its policy of furnishing some of its business statistics only to members of the Association. **531**

BUSINESS METHODS, PHYSICAL TESTING AT SRG

The Southern Rubber Group celebrated its second anniversary by holding symposia on business methods and physical testing, at its October meeting. **551**

BILL BROTHERS PUBLICATIONS

Published monthly by

BILL BROTHERS PUBLISHING CORPORATION

630 Third Avenue, New York 17, N. Y.

NBP BPA

Chairman of the Board, Philip Salisbury. President, John W. Hartman. Senior Vice President and Treasurer, Ralph L. Wilson. Vice Presidents, B. Brittain Wilson, C. Ernest Lovejoy, Wm. H. McCleary. Editorial and Executive Offices, 630 Third Ave., New York 17, N. Y. YUkon 6-4800. Subscription Price: United States and Possessions, $5.00. Canada, $6.00 per year. All other countries, $7.00. Single copies in the U. S. 50¢; elsewhere 60¢. Other Bill Brothers Publications: In Industry: Plastics Technology. In Marketing: Sales Management, Sales Meetings, Tide, Premium Practice. In Merchandising: Floor Covering Profits, Fast Food, Tires-TBA Merchandising. Members of Business Publications Audit of Circulation, Inc.

VOLUME 139, NUMBER 4 JANUARY, 1959

CONTENTS

NEED OF BETTER QUALITY AND AVAILABILITY OF STATISTICS
An editorial by R. G. Seaman 531

PROPERTIES OF ELASTOMERS UP TO 550° F.—I
F. M. Smith 533

VINYL FOAM
Calvin S. Yoran and Robert J. Stockman 542

FUNDAMENTAL CONTROL CONCEPTS—II
Mason E. Wescott 547

SOUTHERN RUBBER GROUP MEETING—I 551

ASME RUBBER & PLASTICS SESSIONS 554

Cover photo: Courtesy of The Goodyear Tire & Rubber Co.

The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

News of the Rubber World 550
Meetings and Reports 551
Calendar of Coming Events 560
Washington Report 561
Industry News 563
News Briefs 572
News About People 575
News from Abroad 580
New Equipment 584
New Materials 586
New Products 590
Book Reviews 592
New Publications 594
Market Reviews 596
Compounding Ingredients Prices 602
Synthetic Rubber Prices 616
Advertisers Index 617

PHILBLACK* PRIMER

E is for Excellent behavior

(even under severe stress and strain!)

Exceptionally good! That's the best way to describe Philblack E! This super abrasion furnace black adds extra durability, extra strength, extra long flex life to rubber compounds. It's recommended for such tough jobs as premium passenger car treads, heavy-duty, off-the-road tires . . . track-type tractor treads . . . industrial hoses and belts.

When you need a carbon black, be sure to determine which Philblack is best suited to your specific requirements. Your Phillips technical representative will be glad to advise. Call on him for expert assistance with rubber or carbon-black problems. No obligation.

*A trademark

LET ALL THE PHILBLACKS WORK FOR YOU!

A — **Philblack A, Fast Extrusion Furnace Black.** Excellent tubing, molding, calendering, finish! Mixes easily. Disperses heat. Non-staining.

O — **Philblack O, High Abrasion Furnace Black.** For long, durable life. Good conductivity. Excellent flex life and hot tensile. Easy processing.

I — **Philblack I, Intermediate Super Abrasion Furnace Black.** Superior abrasion. More tread miles at moderate cost.

E — **Philblack E, Super Abrasion Furnace Black.** Toughest black yet! Extreme resistance to abrasion.

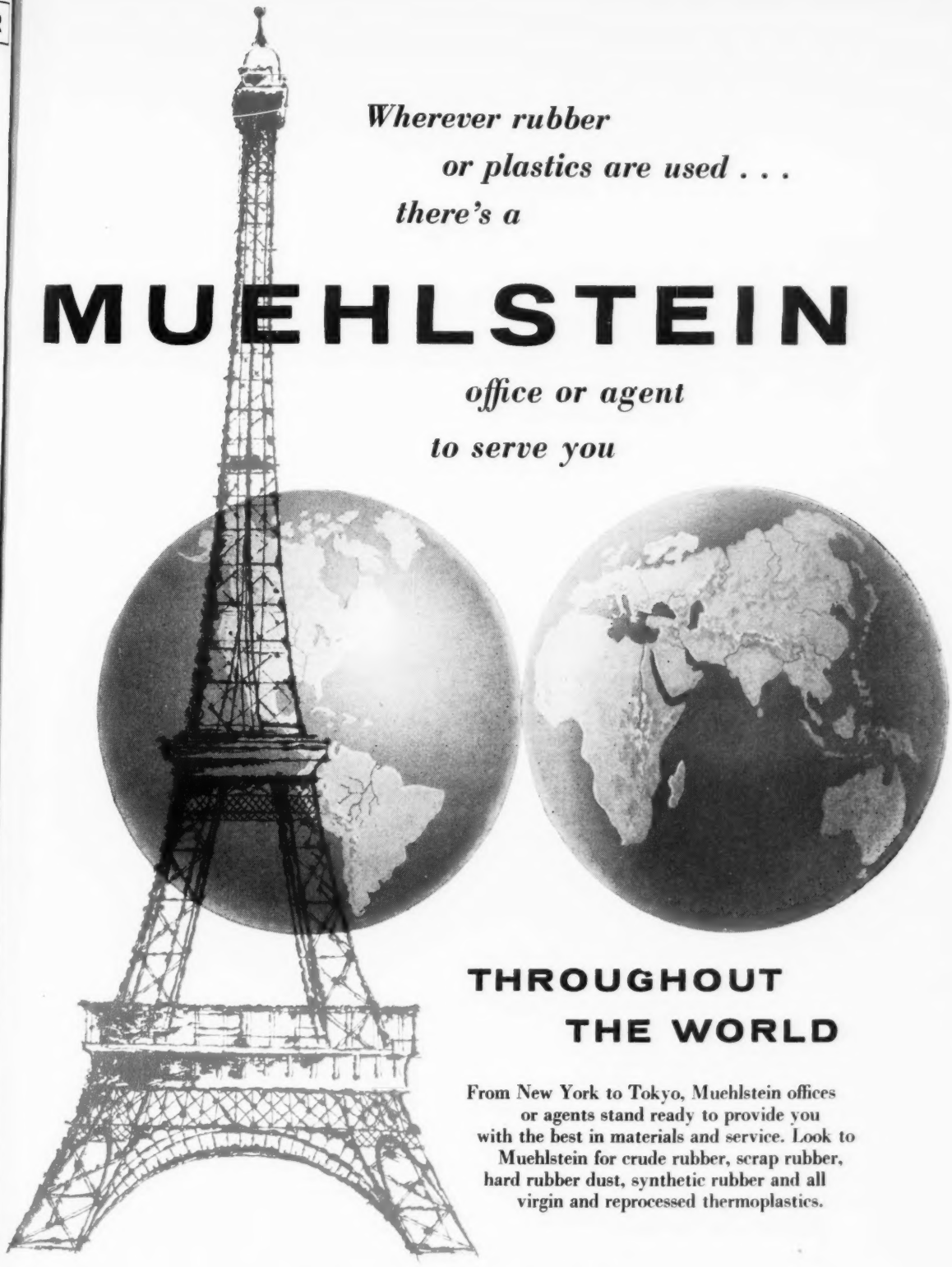
Phillips 66

PHILLIPS CHEMICAL COMPANY, Rubber Chemicals Division, 318 Water Street, Akron 8, Ohio • **District Offices:** Chicago, Dallas, Providence and Trenton
West Coast: Harwick Standard Chemical Company, Los Angeles, California • **Warehouse Stocks** at Akron, Chicago, Trenton, Brighton, Mass. and Toronto, Canada
Export Sales: 80 Broadway, New York 5, New York • **European Office:** Phillips Chemical Company, Limmatquai 70, Zurich 1, Switzerland.

Wherever rubber
or plastics are used . . .
there's a

MUEHLSTEIN

office or agent
to serve you



THROUGHOUT THE WORLD

From New York to Tokyo, Muehlstein offices or agents stand ready to provide you with the best in materials and service. Look to Muehlstein for crude rubber, scrap rubber, hard rubber dust, synthetic rubber and all virgin and reprocessed thermoplastics.

H. MUEHLSTEIN & CO. INC.

60 EAST 42nd STREET, NEW YORK 17, N. Y.

REGIONAL OFFICES: Akron · Chicago · Boston · Los Angeles · London · Toronto

PLANTS AND WAREHOUSES: Akron · Chicago · Boston · Los Angeles · Jersey City · Indianapolis

AGENTS: LONDON · PARIS · ANTWERP · HAMBURG · MILAN · BUENOS AIRES · SANTIAGO · TOKYO · KOBE · LISBON · TANGIERS

Call Hall

HALLCO NEWS

Issued by
The C. P. Hall Co.
Chemical Manufacturers

FIGHTS FOAM FAST!

SAG 470 Silicone Antifoam Emulsion is a NEW and extremely effective antifoam liquid designed specifically for quenching foam in aqueous systems. It is very stable, possesses low viscosity, is inexpensive to use and easy to handle. For quenching, preventing, or controlling foam, SAG 470 will eliminate waste, reduce process time and permit fuller use of productive capacity. Manufactured by: Union Carbide Corporation, Silicones Division. Sold by The C. P. Hall Co.

NEW RUBBER MOLD RELEASE AGENT SAVES 10%

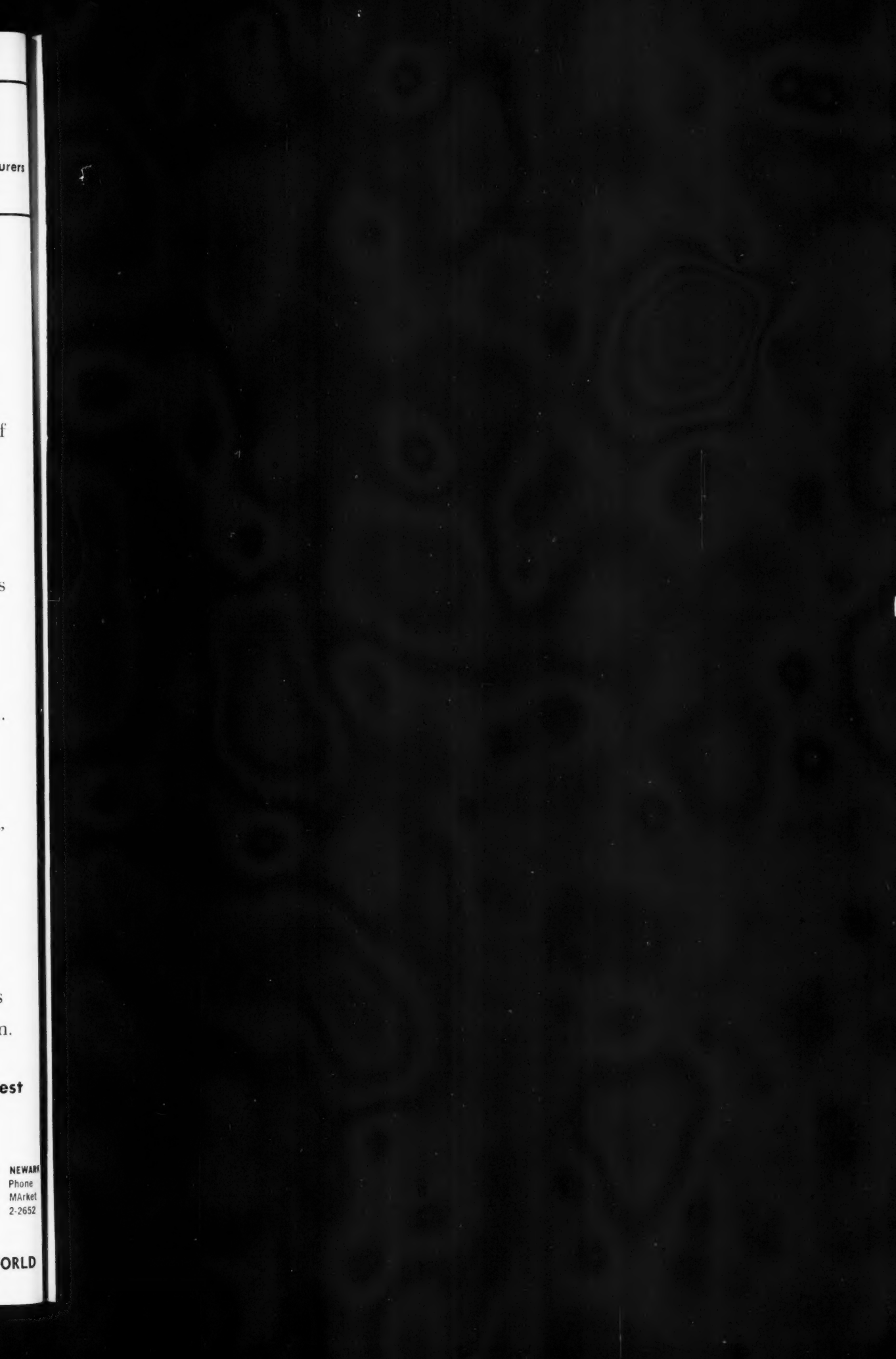
A new high viscosity silicone oil emulsion called LE-46 has recently been introduced by The C. P. Hall Co. Tire manufacturers and retreaders report up to 10% saving over conventional rubber mold release agents. LE-46 provides a more substantial, stable and durable film at mold temperatures, lends itself to automatic spray equipment because it "flats out" extremely well. Manufactured by: Union Carbide Corporation, Silicones Division. Sold by The C. P. Hall Co.

YOUR COMMENTS ARE INVITED

We'd like to know your opinion of this, our first "HALLCO NEWS." It is our intention to give you the latest news on developments for industry, new products from the world of chemistry, new uses for chemicals and their compounds as they become available.
For further information on these or other chemicals "Call Hall" or write: The C. P. Hall Company, Akron.

Samples of SAG-470 and LE-46 Available on Request

AKRON	CHICAGO	MEMPHIS	LOS ANGELES	NEWARK
Phone JEfferson 5-5175	Phone POrtsmouth 7-4600	Phone JAckson 6-8253	Phone MAdison 2-2022	Phone MArket 2-2652



Here's Your Assurance of Fast Deliveries of

HORSE HEAD® PIGMENTS

TITANIUM DIOXIDES
ZINC OXIDES

Wherever You Are—anywhere from Florida to British Columbia, from Quebec to California—you can count on maximum delivery service on l.c.l. shipments of HORSE HEAD pigments:

1. Fast deliveries
2. Storage reserve in depth
3. Your choice from the most complete line of white pigments—titanium dioxides and zinc oxides

THE NEW JERSEY ZINC COMPANY

Founded 1848

160 Front Street, New York 38, N. Y.

BOSTON CHICAGO CLEVELAND OAKLAND LOS ANGELES

Also Distributed by

VAN WATERS AND ROGERS

SEATTLE PORTLAND (ORE.) SPOKANE VANCOUVER, B. C. DALLAS HOUSTON

ST. LAWRENCE CHEMICAL COMPANY, LTD.

TORONTO, ONT. MONTREAL, QUE.

HORSE HEAD PRODUCTS ®

Plasticizer Data

TO HELP YOU CHOOSE THE RIGHT PLASTICIZER

these Harflex® Plasticizers are efficient

Dibenzyl Sebacate

Permanence • Flexibility over wide temperature range • Low volatility • Good electrical properties

Appearance	Clear Liquid or White Solid
Color, APHA	100 max.
Odor	Mild
Specific Gravity 30/20°C.	1.055±0.003
Free Acidity, as Acetic Acid	0.10% max.
Ester Content	99.0% min.

Major uses:

A plasticizer in polyvinyl resins and copolymers, polyvinyl butyral and butadiene—acrylonitrile rubbers.

Dimethyl Sebacate

Extreme efficiency • Excellent low temperature properties

Appearance	Clear Liquid or White Solid
Color, APHA	100 max.
Odor	Neutral
Specific Gravity 30/20°C.	0.986±0.003
Free Acidity, as Acetic Acid	0.02 max.
Ester Content	99.0% min.

Major uses:

A plasticizer in vinyl resins, synthetic rubbers, cellulose nitrate, cellulose acetobutyrate, acrylic resins; as a chemical intermediate, and a neutral, concentrated source of the sebacyl radical.

HARCHEM produces a full line of phthalate, adipate, sebacate and polymeric plasticizers in addition to the plasticizers shown.

The Harchem Division laboratories will gladly assist you with your plasticizer problems, or will supply additional data including formulation test results and formulation suggestions for any Harflex Plasticizer.

Address inquiries to Dept. H-40R

SEBACATES
PHTHALATES
ADIPATES

THE KEY TO HARCHEM® BETTER PLASTICS

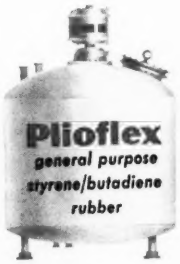
Columbian Carbon Company, Distributor To The Rubber Industry

HARCHEM DIVISION

WALLACE & TIERNAN, INC.
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
IN CANADA W. C. HARDESTY CO. OF CANADA, LTD., TORONTO

something really new and different in styrene/butadiene rubbers

–and it's yours for the ordering



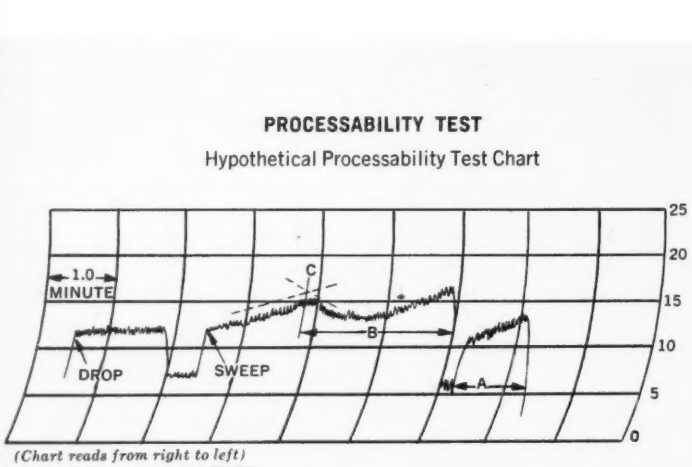
GOODYEAR

CHEMICAL DIVISION

Now–for the first time–yo an

PROCESSABILITY TEST

Hypothetical Processability Test Chart



(Chart reads from right to left)

A. Polymer breakdown time interval **B.** Pigment incorporation time interval

C. Point of complete pigment incorporation

That's right! For the first time–in any rubbe –you can be sure of processability–bale afte bale, shipment after shipment.

How? Simply by specifying PLIOFLEX for al your styrene rubber needs.

Why? Because Goodyear, through refine ment of a previously developed test, has beer able to establish a new control over process ability.

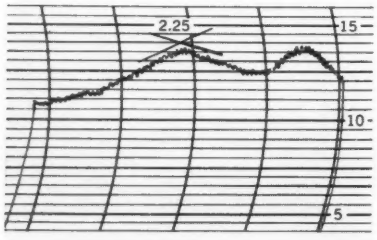
Here's how it works: A laboratory Banbur is loaded with the polymer to be tested, under a specific set of operating conditions. The polymer is masticated. Then certain pig ments are added and the time for their incor poration carefully determined.

Pigment incorporation is the chart-indicated time, in minutes, from the point where the

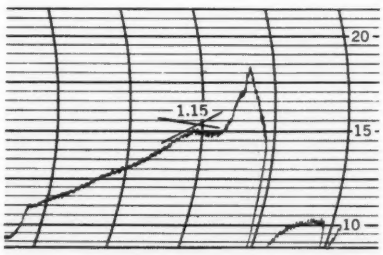
ram is lo to where tion foll incorpora polymer tests, has The resu processal duction pigment lishes a essability This me PLIOFLE you will know th somethin of, in an

*And here are the **A**ssured **P**rocessability Fac*

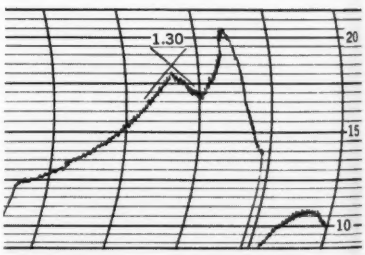
PLIOFLEX 1006 – **APF** = 2.40



PLIOFLEX 1500 – **APF** = 1.25



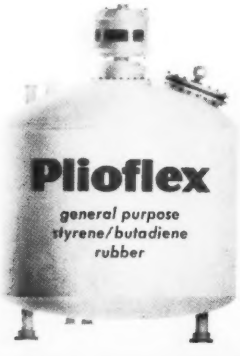
PLIOFLEX 1502 – **APF** = 1.40



PL

NOTE: Shown above are typical Banbury power consumption charts for various PLIOFLEX rubbers. From these charts, maximum pigment incorporation times are determined and Assured Processability Factors established.

PLIOFLEX + Assured Processability Hig



GOOD

CHEMICAL D

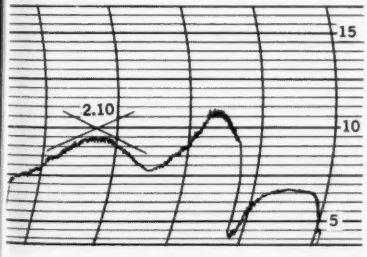
...you can have Assured Processability!

ram is lowered on the pigment-polymer mix to where there is a peak of power consumption followed by a sharp drop. Pigment incorporation time is an excellent gauge of polymer processability and, in hundreds of tests, has proved to be readily reproducible.

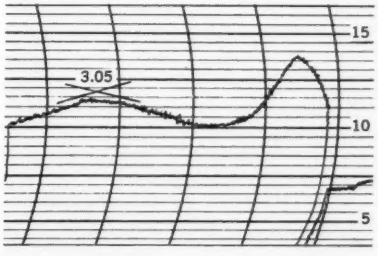
The result? Another industry first—assured processability. Goodyear has set up a production specification, based on maximum pigment incorporation time, which establishes a reproducible control over the processability of every type of PLIOFLEX offered. This means that no matter what type of PLIOFLEX you order, or when you order it, you will know its relative processability and know that it will be consistent. And this is something you could never before be sure of, in any type or brand of rubber.

...ity Factors of typical PLIOFLEX rubbers:

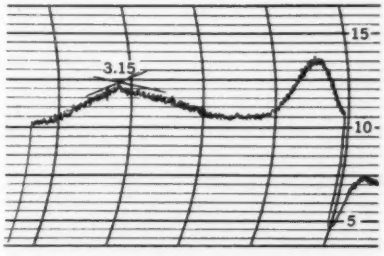
PLIOFLEX 1712 – **APF** = 2.25



PLIOFLEX 1773 – **APF** = 3.15



PLIOFLEX 1778 – **APF** = 3.25



...ty Higher-Quality Products @ Lower Cost

...YEAR

...L DIVISION

IN ADDITION TO ASSURED PROCESSABILITY—

Here are eight more big reasons for specifyin

Plioflex:

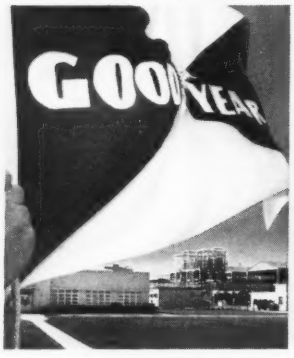
Outstanding research facilities

Extensive sales-service laboratories

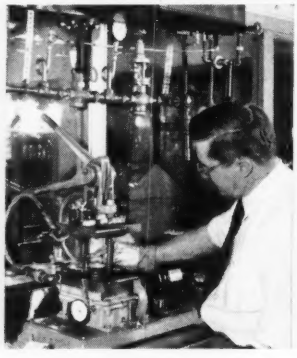
Technically trained representatives

Comprehensive technical literatur

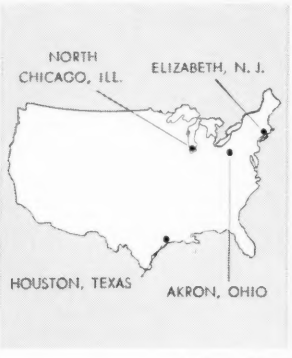
The world's largest dry-rubber plant



Exacting quality control



Strategically located warehouses



Prompt, palletized shipments

Plioflex—T. M. The Goodyear Tire & Rubber Company, Akron, O

There are other reasons, too—

Once you've tried PLIOFLEX, you'll find a number of other reasons for continuing its use. So why not get the full sto today? Just contact your nearest Goodyear Chemical Division Office listed below. Or write Goodyear, Chemic Division, Dept. A-9418, Akron 16, Ohio.

CALIFORNIA, LOS ANGELES
6666 E. Washington Blvd.
Phone: Raymond 3-3611

CALIFORNIA, SAN FRANCISCO
1717 Harrison St.
P. O. Box 648
Phone: Underhill 1-3773

CONNECTICUT, EAST HARTFORD
180 Goodwin St.
Phone: Butler 9-3424

GEORGIA, ATLANTA
2755 Piedmont Rd., N. E.
Phone: Cedar 7-4611

ILLINOIS, CHICAGO
141 West Ohio St.
Phone: Michigan 2-8800

MASSACHUSETTS, BOSTON
66 B St.
Needham Heights
Phone: Hillcrest 4-3900

MICHIGAN, DETROIT
6500 Mt. Elliott Ave.
Phone: Walnut 1-7900

MINNESOTA, MINNEAPOLIS
418 Stinson Blvd.
Phone: Sterling 9-3551

MISSOURI, ST. LOUIS
8544 Page Blvd.
Phone: Harrison 9-4000

NEW YORK, NEW YORK
400 Park Ave.
Phone: Plaza 1-6000

NORTH CAROLINA, CHARLOTTE
929 Jay St.
Phone: Edison 3-1161

OHIO, CLEVELAND
18901 Five Points Rd.
P. O. Box 326
Berea, Ohio
Phone: Clearwater 2-3000

OREGON, PORTLAND
2720 N. W. 35th Ave.
Phone: Capitol 6-2951

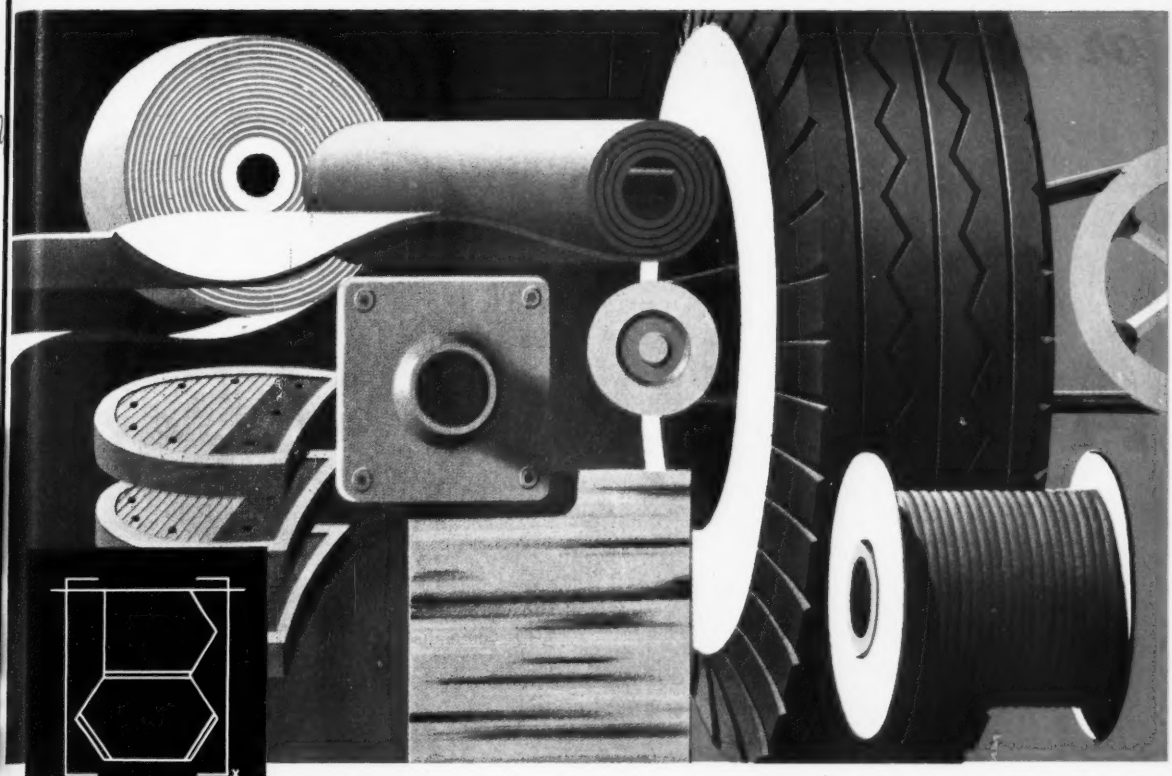
PENNSYLVANIA, PHILADELPHIA
2750 N. Broad St.
Phone: Baldwin 8-8500

TEXAS, HOUSTON
5544 Armour Dr.

Phone
Walnut
3-554

CHEMICAL
GOODYEAR
DIVISION

Janu



Raise Quality and Lower Costs With Neville Coumarone-Indene Resins

Coumarone-indene resins by Neville have become standard in the processing of rubber for an ever-increasing variety of products in ever-greater volume throughout the years. Here's why. Users find that Neville gives them constant good quality and fast service, and they save production time and costs and produce better products when they use coumarone resins. Also, Neville has a broad variety of these ideal extender-plasticizers in various grades and melting points to suit every product need. Our chemists will gladly assist yours in selecting the proper one for your purpose. Use the coupon to write for further information.

Neville Chemical Company, Pittsburgh 25, Pa.

Resins — Coumarone - Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils** — Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents** — 2-50 W Hi-Flash,* Wire Enamel Thinners, Nevsolv.*

* Trade name

NEVILLE

Please send information on Neville Chemicals

NAME TITLE

COMPANY

ADDRESS

CITY NC 3-RW STATE

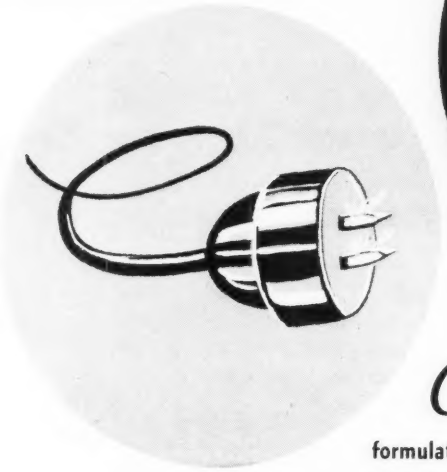
for maximum sun-checking protection

Specify
Original
Formula

"ANTISUN"*

by **CARY**

Maximum protection against sun-checking over extended periods can only be guaranteed when a top-notch sun-checking agent is employed.



*Registered Trade Mark

Cary "Antisun", formulated of the finest quality ingredients and proven so satisfactory in tire compounding, mechanical goods, insulated wire and cable compounds, is still the same basic formula developed by our President years ago.

Accept no substitute for this time-tested highest quality product—CARY "ANTISUN."

- Recommended usage: 2-4% of the weight of the rubber hydrocarbon, depending on the degree of protection desired.
- Unlimited Availability.
- Low Cost.
- Available in convenient chipped or slabbed forms.

CARY CHEMICALS INC.

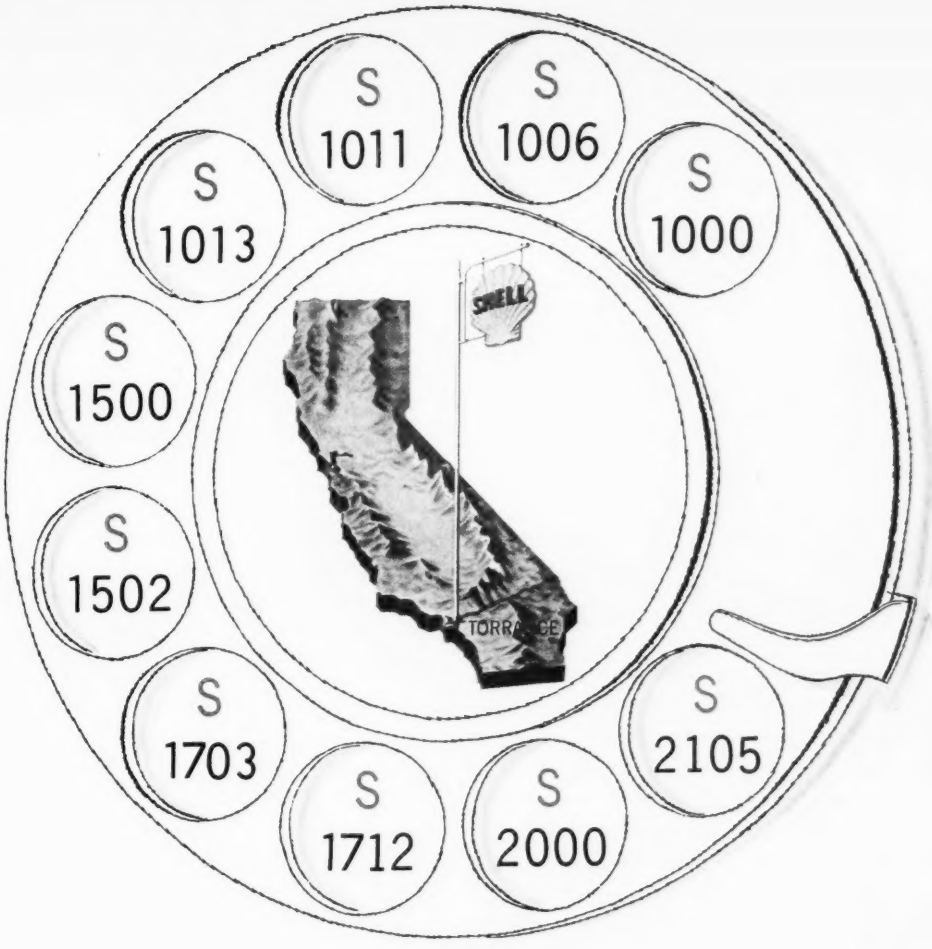
CARY CHEMICALS INC.

MAIL ADDRESS: PO BOX 1128, NEW BRUNSWICK, N. J.

PLANTS AT: EAST BRUNSWICK & FLEMINGTON, N. J.

VINYL RESINS • VINYL COPOLYMERS • VINYL COMPOUNDS • SPECIALTY WAXES
HIGH MELTING POINT SYNTHETIC WAXES

Canadian Representative: Lewis Specialties, Ltd., 18 Westminster North, Montreal 28, Que.



Pick a number—from 1000 to 2105

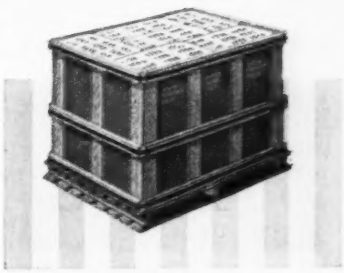
YOU ALWAYS WIN when you specify Shell's hot, cold, oil-extended polymers, black masterbatches, hot or cold latices.

When you need general purpose synthetic rubber, you're sure to win when you pick a number from Shell Chemical's catalog. And you can choose what you need from the widest variety of synthetic rubber available from a single source—Torrance, California.

In addition to full value for your money—in product and delivery—you benefit from one of the broadest research and development programs in the synthetic rubber industry. Improved quality, new polymers, and advances in packaging † help you make better products at lower cost.

Use Shell Chemical's Technical Service when you are searching for practical solutions to troublesome technical problems. Write today for full information . . . or better still, phone Los Angeles, FAculty 1-2340.

*Shell Chemical Trademark



† Shell offers you the Flotainer* package, a strong, lightweight, steel-strapped wooden container that holds 42 film-wrapped bales. The "Flotainer" controls cold flow in uncured synthetic rubber; prevents contamination; simplifies and speeds handling; lets you store 20 tons of rubber on less than 100 sq. ft. of floor space. Write for an illustrated bulletin on this packaging innovation.

SHELL CHEMICAL CORPORATION

SYNTHETIC RUBBER SALES DIVISION
P. O. BOX 216, TORRANCE, CALIFORNIA

SHELL

Cooking up a better rubber recipe?

Add a pinch of permanence

Will the properties you put into a rubber compound today still be there later, when you need them?

Many firms *make sure* they will be—by compounding with Durez phenolic resins.

Mix one of these versatile resins with synthetic rubber, and it melts under heat to plasticize the stock for easy working and accurate molding. Then the resin cures rapidly, toughening the stock; making it hard, stiff, abrasion resistant. With some types of rubber, fast cure is accomplished without using sulfur or accelerators; high tensiles are achieved without fillers.

Because these resins are heat-setting, the hardness and stiffness they bring to a stock are retained at temperatures as high as 250° F. You get *more permanence* than with other types of resins—and you pay less for it.

Durez resins are completely compatible with nitrile rubbers. Their compatibility with SBR is less, but can be increased greatly by using some nitrile rubber as a common solvent or flux. The resins are proving effective also for hardening and reinforcing nitrile rubber, natural rubber, and neoprene.

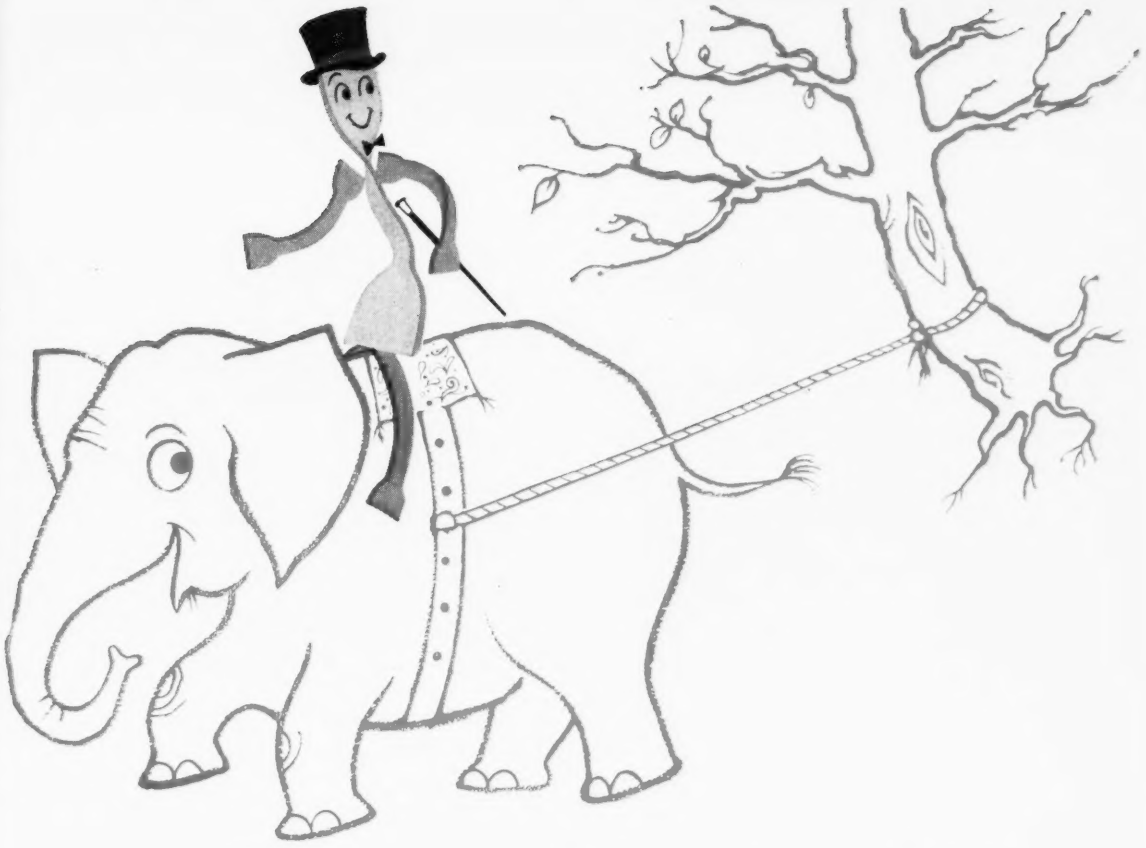
You can get these versatile resins in powder, lump, liquid, and emulsion forms—to meet widely varying process requirements. For more complete information on how they are used, write for illustrated bulletin, "Durez Resins in the Rubber Industry."

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

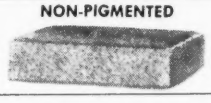
HOOKER CHEMICAL CORPORATION

201 Walck Road, North Tonawanda, N. Y.



Philprene* does tough, hard jobs...easily!

CURRENT PHILPRENE POLYMERS

	NON-PIGMENTED 	PIGMENTED WITH PHILBLACK
HOT	PHILPRENE 1000 PHILPRENE 1009 PHILPRENE 1001 PHILPRENE 1010 PHILPRENE 1006 PHILPRENE 1018 PHILPRENE 1019	
COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1601 PHILPRENE 1605
COLD OIL	PHILPRENE 1703 PHILPRENE 1706 PHILPRENE 1708 PHILPRENE 1712	PHILPRENE 1803 PHILPRENE 1805

Philprene tire treads have abrasion resistance that would make a pachyderm blush for shame! Industrial belts and hoses have an elephant's toughness and strength! You can get the qualities you need most in your finished product by selecting the correct Philprene rubber. And because Phillips Chemical Company makes the largest variety of commercially available polymers on the market, you have a wide choice.

Phillips is a pioneer in the rubber field. Many of the important technical developments now used by the industry are the direct results of Phillips research.

Call your Phillips technical representative for practical, definite answers to your rubber problems. Phillips technical help and Phillips unfailing source of supply are important considerations when placing your rubber order. Take full advantage of the unique benefits which a Phillips customer enjoys.

PHILLIPS CHEMICAL COMPANY

Rubber Chemicals Division, 318 Water St., Akron 8, Ohio.

District Offices: Chicago, Dallas, Providence and Trenton.
West Coast: Harwick Standard Chemical Company, Los Angeles, California.
Warehouse Stocks at Akron, Boston, Chicago, and Trenton
Export Sales: 80 Broadway, New York 5, New York.
European Office: Phillips Chemical Company, Limmatquai 70, Zurich 1, Switzerland

*A trademark

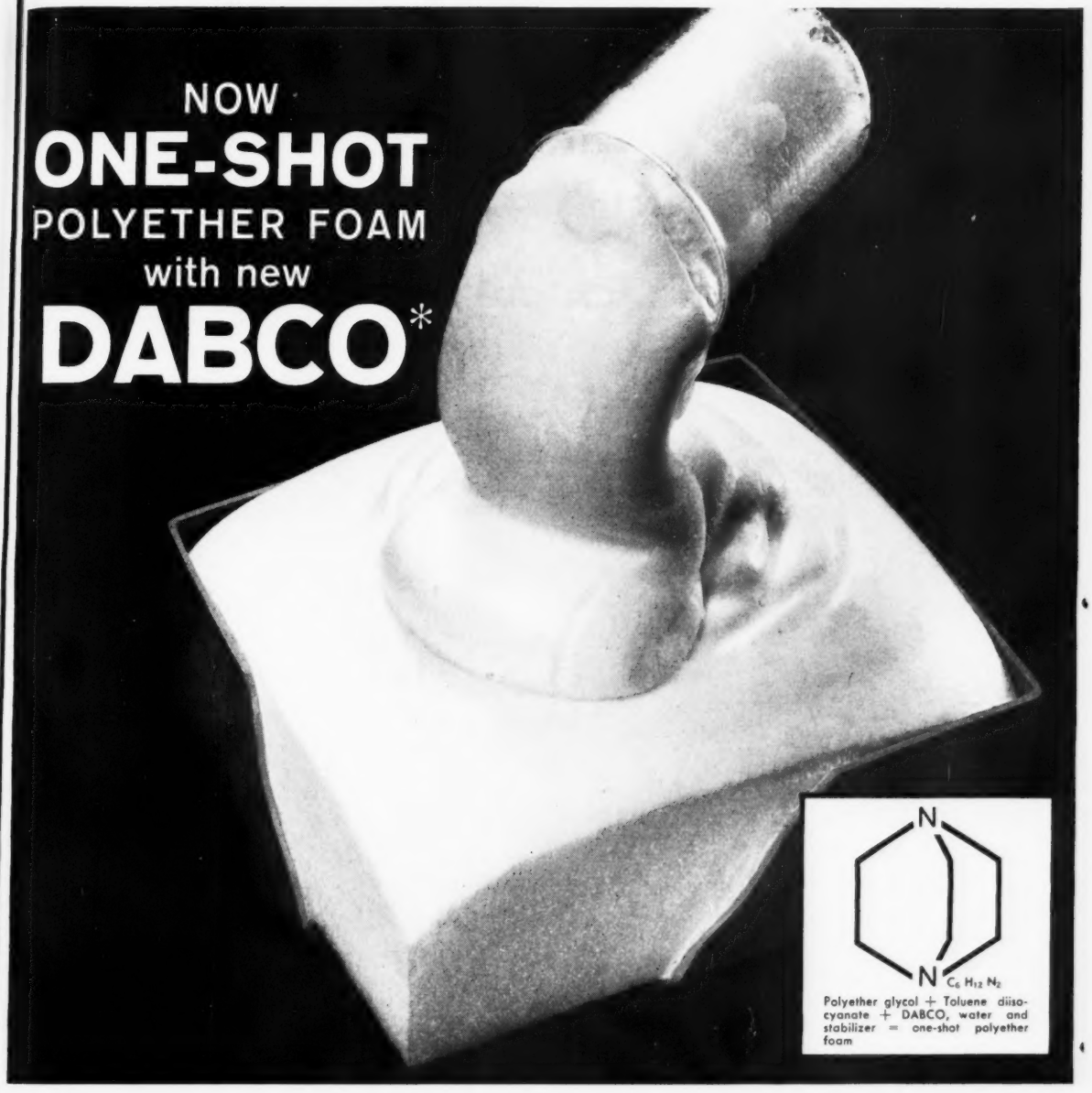
TITANOX* to the rescue! Part of the appeal of vinyl-covered furniture lies in its light or pastel finish . . . and part of the appeal of TITANOX titanium dioxide white pigments is how economically they produce properties of whiteness, brightness and opacity in plastic or rubber stocks. Whether your formula calls for TITANOX-RA, TITANOX-RA-50 or TITANOX-RA-NC; you'll find these leading white pigments a pleasure to work with—in uniformity that permits easy regulation of opacity and tint, in the contribution they make to product durability, and in ease of processing. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities.

TITANIUM PIGMENT CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

*TITANOX is a registered trademark for the full line of titanium pigments offered by Titanium Pigment Corporation.

5728



Now, you can produce odorless, flexible, semi-rigid or rigid urethane foams from all commercial urethane grade polyols . . . *in one simple, economical operation.* New DABCO gives you these production advantages:

- Fast cure • Prepolymer step eliminated
- Process in existing equipment
- Low catalyst concentration economy

DABCO produces foams with such good physical properties as:

- Low compression set • Uniform cell structure
- Excellent tensile, tear strength and elongation
- Dimensionally stable • Resistant to humid aging
- Good molding characteristics • No odor

DABCO is now used commercially here and abroad to produce polyether prepolymer and adipic acid ester type crash pads and polyether prepolymer and dimer acid ester foams for seating and load-bearing applications. Other fields are being explored for new DABCO, for which your inquiries are invited.

Write for complete information.

*HOUDRY PROCESS CORPORATION TRADEMARK FOR TRIETHYLENEDIAMINE

The structure and properties of DABCO suggest the following other possible areas of interest:

- Chain transfer agent in radical catalyzed polymerizations
- Activator for peroxide catalyzed polymerization
- Transesterification and cyanoethylation catalyst
- Complexing agent for metals

HOUDRY
PROCESS CORPORATION
1528 Walnut Street, Phila. 2, Pa.

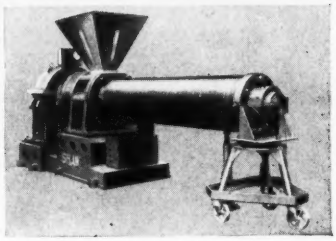
HOUDRY means Progress . . through Catalysis

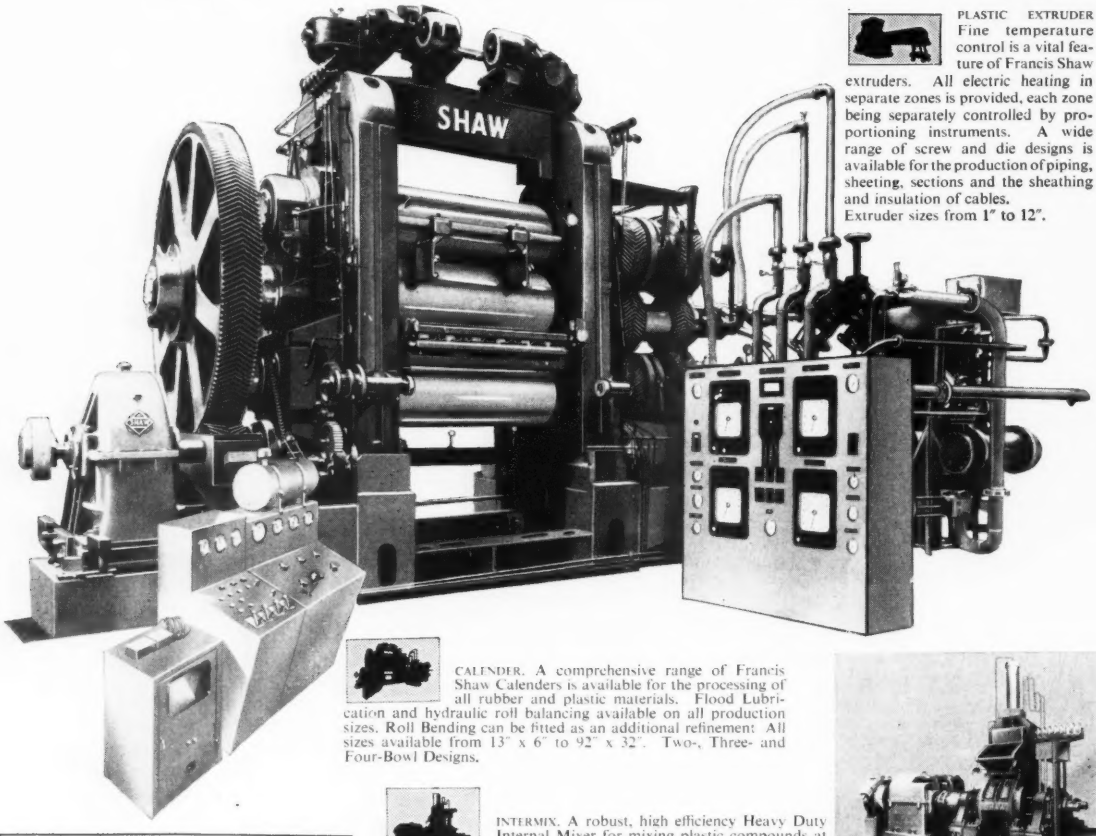
FRANCIS SHAW

quality engineering puts efficiency into Shaw machines

The cost-cutting performance of every Francis Shaw machine and its thorough dependability are the result of long experience and unvarying high standards of engineering in every detail of manufacture.

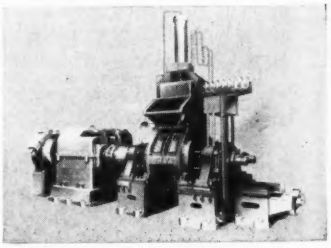
Close-limit accuracy and rigorous inspection during manufacture guarantee to the user a consistently high quality output from Francis Shaw equipment.





PLASTIC EXTRUDER Fine temperature control is a vital feature of Francis Shaw extruders. All electric heating in separate zones is provided, each zone being separately controlled by proportioning instruments. A wide range of screw and die designs is available for the production of piping, sheeting, sections and the sheathing and insulation of cables. Extruder sizes from 1" to 12".

CALENDER. A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood Lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13" x 6" to 92" x 32". Two-, Three- and Four-Bowl Designs.



INTERMIX. A robust, high efficiency Heavy Duty Internal Mixer for mixing plastic compounds at lower-than-normal temperatures. It is supplied with steam heating for plastics and other materials, and the exclusive rotor design ensures consistent high quality mixing.

FRANCIS SHAW

QUALITY ENGINEERING FOR QUANTITY PRODUCTION

Francis Shaw are available for the design, manufacture, and installation of a wide range of processing equipment

FRANCIS SHAW & COMPANY LIMITED MANCHESTER 11 ENGLAND

TELEPHONE EAST 1415-8 TELEGRAMS CALENDER MANCHESTER TELEX 66-357

LONDON OFFICE 22 GREAT SMITH STREET SWI *PHONE ABBEY 3245* *GRAMS VIBRATE LONDON TELEX 2-2250*

FRANCIS SHAW (CANADA) LTD GRAHAMS LANE BURLINGTON ONTARIO CANADA

TELEPHONE NELSON 4-2350 *TELEGRAMS CALENDER BURLINGTON ONTARIO*

P.1160

1925 — The Year United Carbon was Founded . . .

By 1925 America truly was on wheels. More than 12 million cars and trucks glided — and rattled and bounced — over our ever-growing highway system.

In February, 1925, United Carbon Company was formed. In that year our channel carbon black plants produced some 34 million pounds of blacks for the growing rubber industry and for allied uses.

Today, a third of a century later, the amazing growth pattern that our nation has set still is dependent on the wheel. And this wheel is rubber-clad.

In our 34 years, United Carbon has produced more than 5½ BILLION pounds of carbon blacks for the rubber and associated industries. With this vast accumulation of experience, and the vast technological growth that has come with the years, it is not surprising that UNITED CARBON BLACKS are esteemed everywhere for their uniform excellence.

Standardize on UNITED CARBON BLACKS. They'll serve you well.

UNITED CARBON COMPANY, INC.

is the key word for carbon black when the aim is superior reinforcement.

DIXIE Blacks are produced scientifically in 15 types by furnace and channel processes from carefully selected oils and from natural gas.

DIXIE Blacks rate high for safe, easy processing; fast, tight cure; maximum reinforcement and equally high resistance to wear, tear, flex and aging.

DIXIE Blacks are up to date in quality, highly uniform, and designed to strengthen rubber for exceptional service. They have been used world-wide for decades to give better performing rubber.

There is a **DIXIE** Black to suit the most discriminating compounder, meeting his requirements for every type rubber and practically every application.

Avoid doubt. Standardize on **UNITED CARBON BLACKS.**

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

CHARLESTON 27, WEST VIRGINIA

NEW YORK AKRON CHICAGO
BOSTON LOS ANGELES MEMPHIS

IN CANADA: CANADIAN INDUSTRIES LIMITED

it's what
it doesn't have
that makes it good!

National®
ANILINE

What doesn't our aniline have that makes it so good?

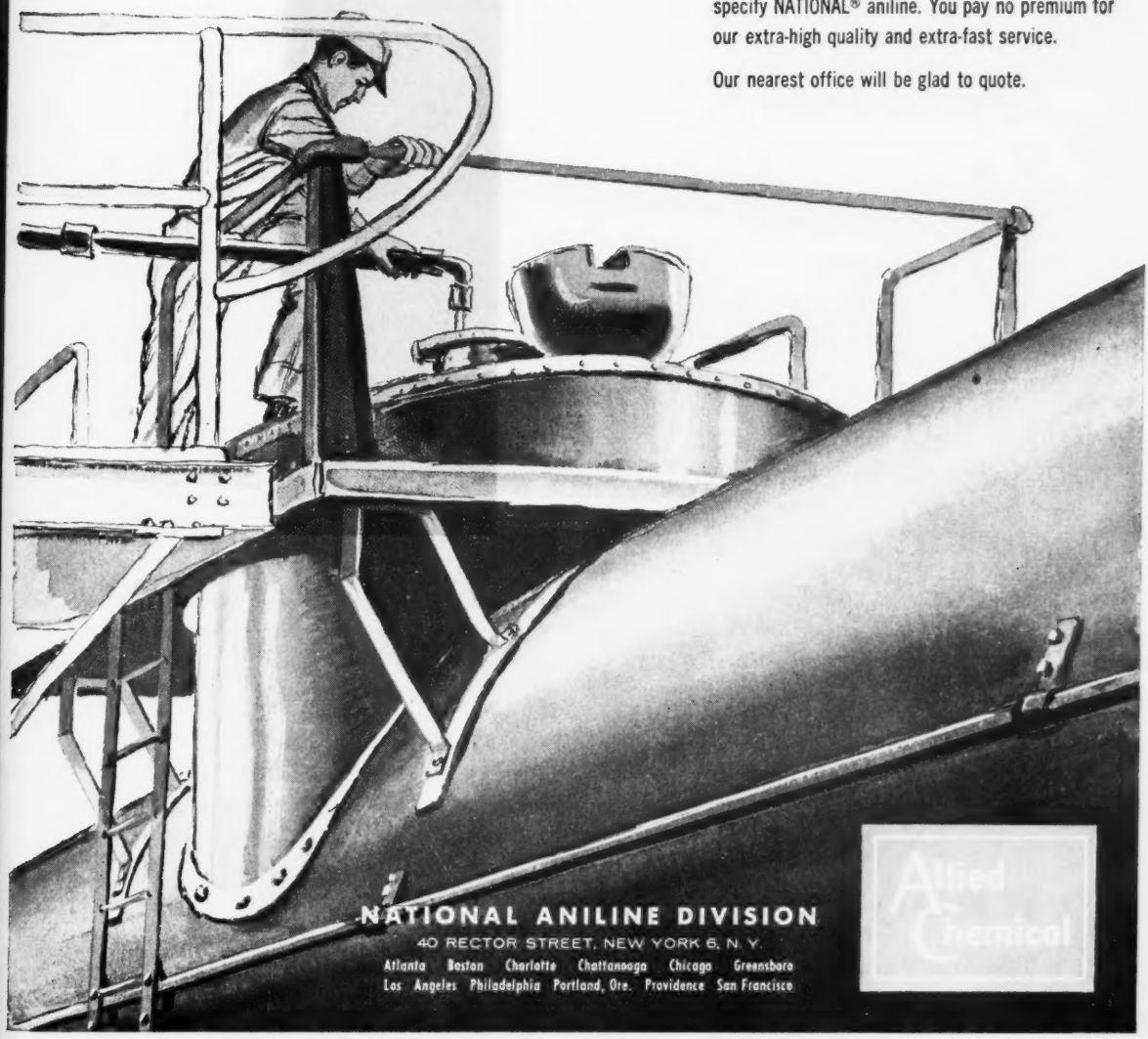
It has very little moisture (4/100 of 1% maximum).

It has very little color (Barrett Standard 1.0).

It has very low total impurities. (Our shipping spec is 99.9% but we regularly load cars analyzing 99.95+% That's better than ACS CP aniline specs).

So if you want clear, colorless, nearly dry, high-purity aniline shipped by tank car or tank wagon from Moundsville, West Virginia, on 24-hour notice, specify NATIONAL® aniline. You pay no premium for our extra-high quality and extra-fast service.

Our nearest office will be glad to quote.



NATIONAL ANILINE DIVISION
40 RECTOR STREET, NEW YORK 6, N. Y.
Atlanta Boston Charlotte Chattanooga Chicago Greensboro
Los Angeles Philadelphia Portland, Ore. Providence San Francisco

Allied Chemical

Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber

6-year-old proves PARACRIL OZO far outwears best competitive sole!

A typically active young boy in a small Ohio town has added to the evidence of numerous laboratory and actual wear tests—*shoe soles made of new PARACRIL OZO outwear all others 3 to 1!*

Two pairs of shoes were used in this test, each pair worn every other day to provide similar test conditions. The first pair, with good quality conventional soles, became unfit for use in a little over six weeks' time. Yet the shoes with PARACRIL OZO soles—despite the kicks, scrapes, grinds, and special kind of abuse for which little boys are known—showed only a fraction of the wear. At the end of the test they were still good for months.

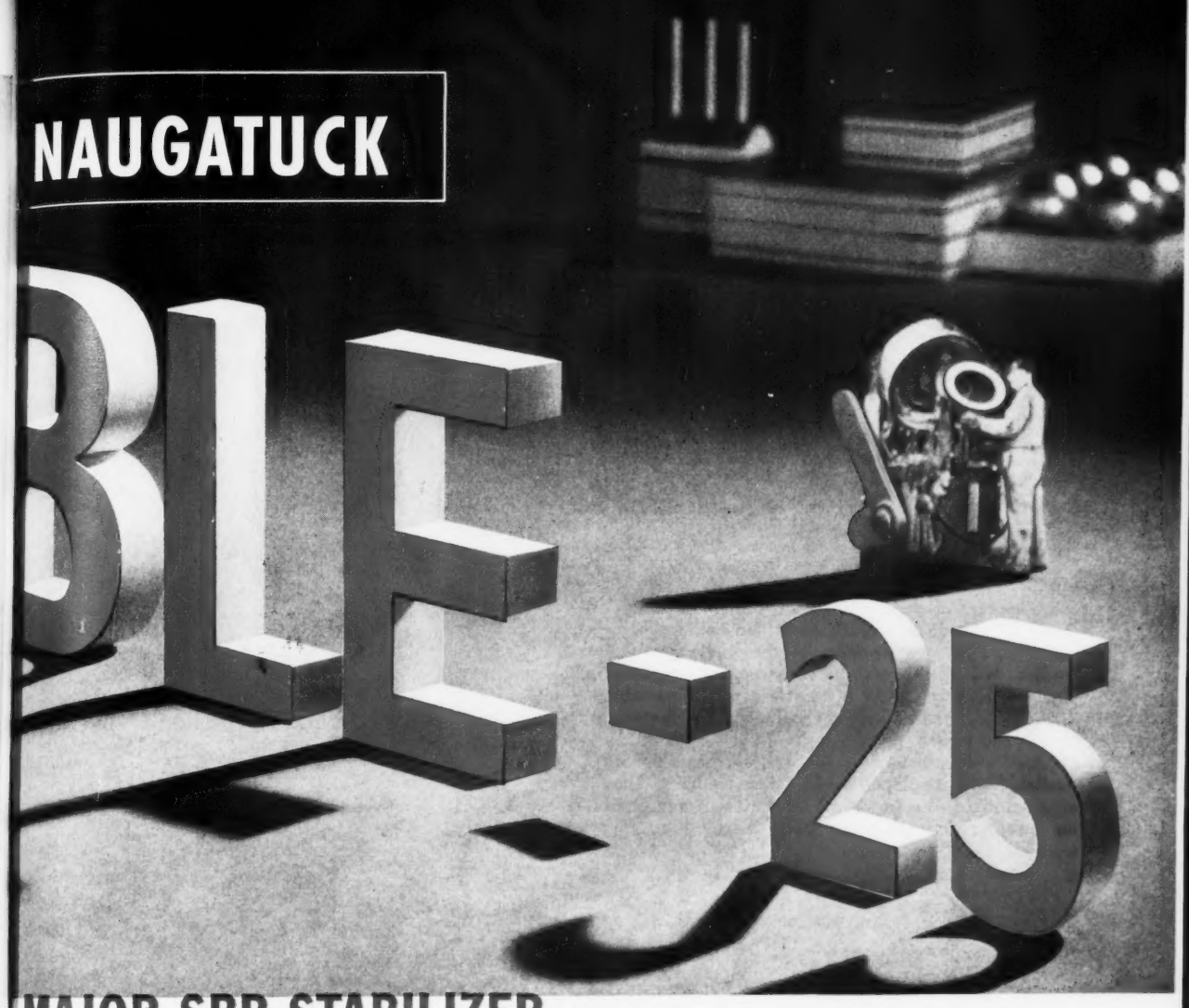
Take a tip from the tot. Insist on PARACRIL OZO soles for the shoes you sell. It makes a major selling difference. To learn more about PARACRIL OZO, write the address below. Names of sole manufacturers on request.

Naugatuck Chemical

Division of United States Rubber Company 111P Elm Street Naugatuck, Connecticut

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N. Y.

NAUGATUCK



MAJOR SBR STABILIZER

...THE TIRE INDUSTRY'S ANTIOXIDANT STANDARD

B-L-E—25 does *double duty*. (1) Added as an emulsion to the styrene-butadiene polymers, it is retained during and after flocculation and drying... *stabilizing* the rubber against heat and oxidation during storage and processing. (2) In finished products, B-L-E—25 continues to protect against *oxidation, flex-cracking* and *heat aging*.

B-L-E—25 is the improved lower viscosity form of the original B-L-E®. It is especially designed for faster pouring, easier emulsification, better dispersion.

Long the standard of quality in the tire industry, B-L-E—25 also provides balanced heat and flex-resistance in other types of synthetic and natural rubber products, where discoloration and staining are not factors.

NAUGATUCK CHEMICAL
110R Elm Street, Naugatuck, Conn.

- ☐ Please send data on B-L-E—25.
- ☐ Have representative call.
- ☐ Add my name to your mailing list to receive technical literature as it is issued.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

Naugatuck Chemical
Division of United States Rubber Company
110R Elm Street
Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

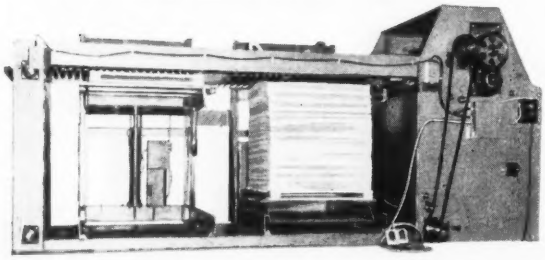
INCREASE PRODUCTION . . . DECREASE COSTS

With

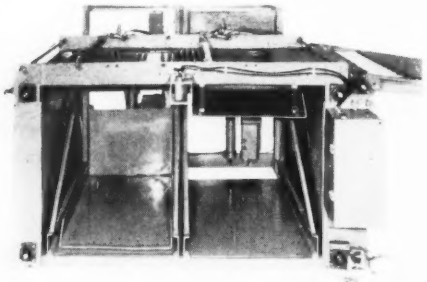
NEW HIGH SPEED

Automatic

Cutting and Stacking Units

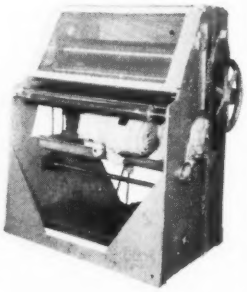


These highly efficient machines are furnished separately or as a complete self-contained unit for automatic cutting and stacking of materials from extruders, mills, calenders, and other processing lines. The Alfa Rotary Cutter is complete with a variable drive for automatic synchronization to the material speed, and length of cut can be easily and infinitely adjusted within the given range. Alfa Stackers are available with single or double stacking units. They accommodate a wide variety of materials and stack on lowering skids that are easily handled by fork truck.



CUTTING and STACKING FEATURES . . .

- Blades easily adjusted to micrometer exactness
- Cuts and stacks at speeds up to and exceeding 100/ft. min.
- Handles material widths from 24" to 50"
- Cuts lengths from 24" to 60"
- Stack per skid 40" high, max. skid load 4000#

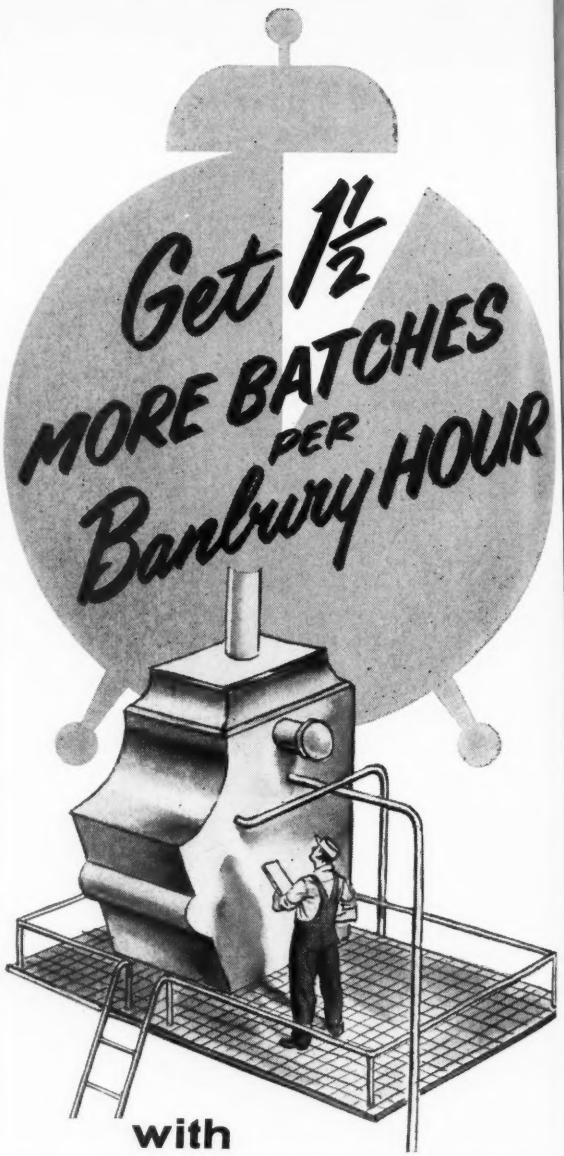


SPADONE MACHINE CO. INC.

SOUTH NORWALK, CONN. PHONE: VOlunteer 6-3394

Representative for Alfa Machine Co.

Get 1½ MORE BATCHES PER Banbury HOUR



with

RECLAIMATOR

Profit-building RECLAIMS

● Time costs are substantially lower with Reclaimator Reclaims because they will take 10% higher loadings. Material costs are lower because cooler mixing produces less scorched compound and the right plasticity creates better dispersion. This all adds up to MORE USABLE COMPOUND, lower costs and GREATER PROFITS for you!

Let us send you all the facts!

●

WRITE FOR FREE SAMPLE AND DESCRIPTIVE LITERATURE 21

U.S. RUBBER RECLAIMING CO., INC.

P. O. BOX 365 BUFFALO 5, NEW YORK

SOLUTIONS TO YOUR COMPOUNDING PUZZLE...

New Polyurethane-type rubber

GENTHANE-S

Consider these advantages of products derived from this stock

- VERY GOOD OZONE RESISTANCE
- EXCELLENT OIL RESISTANCE
- REMARKABLE HEAT RESISTANCE
- OUTSTANDING ABRASION RESISTANCE

If you're looking for rubber stock with unique qualities to solve tough product requirements, Genthane-S may offer an easy solution to your problem. Combining excellent ozone, oil, heat and abrasion resistance with ability to be processed on existing equipment, this stock has numerous applications in specialty-compounding . . . for example, industrial tires, footwear, valve diaphragms, impellers, grommets and oil field supplies. Genthane-S polyurethane elastomer is available in semi-commercial quantities now. Send for a sample shipment and complete literature today!

THE GENERAL TIRE & RUBBER COMPANY

CHEMICAL DIVISION, DEPT. A

AKRON, OHIO

Creating Progress Through Chemistry

Chemical Division GENERAL THE GENERAL TIRE & RUBBER CO.

AGENT 36
SILICONE SQUAD

HOW I KEPT A LAUNCHIN' DATE

FROM THE OFFICIAL FILES OF DOW CORNING

THE RUBBER SEAL, VON GARD! THE SEAL! WHERE IS IT? WE'RE COUNTING.
ACH! DER MOLDER NEIN SPECS MEETS. DAS MOLDS BEN GESTICKEN
POST NO BILLS
1

MEANWHILE, BACK AT THE PLANT...
ANOTHER NO GOODNIK!
WE'VE HAD IT. LET'S GO BACK TO MAKING JAR RUBBERS.
OVER MY DEAD DAGUERREOTYPE.
2

I HEARD YOUR DISTRESS BEEP AND BLASTED RIGHT OVER. PUT DOW CORNING SILICONES TO WORK. YOU'LL HAVE A PERFECT SEAL EVERYTIME.
I'M WITH YOU, 36.
AGENT 36
NIKE KNIGHT
4

THE DIFFERENCE IS DOW CORNING 36 EMULSION! MOLDS RELEASE EASILY... GIVE SHARP SURFACE DETAIL. YOU REDUCE SCRAP, SPEED PRODUCTION, CUT MOLD CLEANING TIME, SAVE MONEY. ALL THAT!
OUR FOUNDER
AGENT 36
BY GEORGE, I THINK WE'VE GOT IT!
YOU'RE A DOLL, 36.
5

MEANWHILE, BACK AT THE LAUNCHING PAD...
STILL SANS SEAL? WE'LL NEVER ORBIT, ALBERT.
VOT A BUST. VOT A VASTE!
LISTEN! THEY'RE PLAYING OUR SONG.
YES, "HOW HIGH THE CHEESE"
6

AND NOW... THE HAPPY ENDING
THERE SHE GOES, AT LAST! THE SEAL WAS PERFECT... WHAT A BLAST!
VOT'S DER SCHIECRET, 36? DON'T LEAF UNS MID-LUFT
CONFIDENTIALLY, DOW CORNING SILICONES. THEY'LL HELP ANYONE WITH MOLD RELEASE PROBLEMS.
AGENT 36
THAT SEAL PUTS PI IN THE SKY!
7

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

ESTERS FOR INDUSTRY

Since KESSLER *1921*

GLYCEROL ETHYLENE GLYCOL DIETHYLENE GLYCOL POLYETHYLENE GLYCOL PROPYLENE GLYCOL POLYPROPYLENE GLYCOL BUTANEDIOL TRIMETHYLOL ETHANE TRIMETHYLOL PROPANE ISOPROPANOL BUTANOL 2-ETHYLHEXANOL ISOOCTYL ALCOHOL DECANOL LAURYL ALCOHOL STEARYL ALCOHOL OLEYL ALCOHOL METHOXYETHANOL BUTOXYETHANOL CYCLOHEXANOL	+	OLEIC ACID STEARIC ACID PALMITIC ACID MYRISTIC ACID LAURIC ACID UNDECYLENIC ACID PELARGONIC ACID 2-ETHYLHEXOIC ACID ACETIC ACID RICINOLEIC ACID PHTHALIC ACID ISOSEBACIC ACID ADIPIC ACID TARTARIC ACID FUMARIC ACID	= THE ESTER FOR YOUR APPLI-CATION

Kessler will prepare products to suit your own particular requirements. Our Technical Service Laboratory is always ready to assist you. Write or call, outlining your specific needs.

KESSLER CHEMICAL CO., Inc. KESSLER CHEMICALS **State Road & Cottman Ave. PHILADELPHIA 35, PA.**

PLASTICS 1959

INTERNATIONAL TRADE FAIR OF THE INDUSTRY

October 17-25, 1959
Duesseldorf/West Germany

For complete information write: NOWEA, Nordwestdeutsche Ausstellungs—Gesellschaft m.b.H., Duesseldorf, Ehrenhof 4, *Telephone:* 44041, Cable Address: *NOWEA*, Duesseldorf

For information in USA:
German-American Trade Promotion Office
350 Fifth Avenue, New York 1, N. Y.
Telephone: WIsconsin 7-0727

COPO®

means good service in cold rubber...

and good service paves the way for

"Easy Going"

SALES OFFICES			WAREHOUSES
Hartford, Connecticut . . .	Chapel	7-5731	Charleston, Mass. (Latex)
Atlanta, Georgia	Plaza	3-7833	Neosha, Missouri
Chicago, Illinois.	Sycamore	8-8957	Newark, New Jersey
Akron, Ohio	Walbridge	8-3226	Akron, Ohio
Philadelphia, Pennsylvania .	Rittenhouse	6-4663	Chicago, Illinois

pioneering · uniformity · well-packaged · high quality

COPOLYMER RUBBER & CHEMICAL CORPORATION
BATON ROUGE 1, LOUISIANA

COPOLYMER CRCC RUBBER & CHEMICAL CORPORATION

COLD RUBBER SPECIALISTS

LINERETTE

for faster Separation on Making Lines

Separation of stock and Linerette paper on the making lines is an easy, efficient operation. Linerette, a specially processed separating paper, prevents adhesion, insures faster operation on the making lines.

And Linerette features are important in other phases of processing, too. Frictioned stocks may be fed from the calender right into Linerette. It leaves no objectionable cloth marks and contains no oil or wax. When used in die-cutting operations, clippings may be worked away with regular scrap.

Linerette supplies additional savings when used in shipping lightweight stocks—there is no need to return a fabric liner. Where cleanliness is a vital factor, Linerette serves as a low cost lining for trays and containers.

Linerette is supplied in any width up to and including 54", in rolls of 9", 11½", 13", and 15" diameters; put up on 3" i.d. cores. The yield is approximately six square yards to the pound. A 9" roll contains 375 linear yards and a 15" diameter about 1150 linear yards.

SAMPLES SENT ON REQUEST—*simply specify width desired.*

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio, U.S.A.
Cable Address: "BLUELINER"

GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.

LINERETTE
INTERLEAVING PAPER

CLIMCO — THE CLEVELAND LINER & MFG. CO. — CLEVELAND OHIO, U.S.A.

MADE BY THE MANUFACTURERS OF *CLIMCO* PROCESSED LINERS

ADDITION

ADDITION—Calcene® CO, a new grade of calcium carbonate, is the latest of Columbia-Southern's outstanding Calcene pigments. You now have three from which to choose:

CALCENE TM (Original product) Surface-coated for fast and thorough dispersion.

CALCENE NC (Non-Coated) Better in color than TM, but slightly harder dispersing.

CALCENE CO (Coated) Clean white to provide true color values in finished goods.

ADDITION—Calcene may provide your rubber products with additional advantages required for better looks, better wear, better price. Use Calcene for pastel or colored goods . . . for improved hot tear resistance . . . for an equivalent high level of uniform physicals at greater economy compared with more costly ultra-fine carbonates. Local stocks provide fast service in Boston, Hoboken, Chicago and Los Angeles. For an **ADDITIONAL** idea in your operations, why not investigate Calcene now. Price information and formulation suggestions may be obtained by contacting your nearest Columbia-Southern office or by writing Room 1929W, One Gateway Center, Pittsburgh 22, Pennsylvania.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

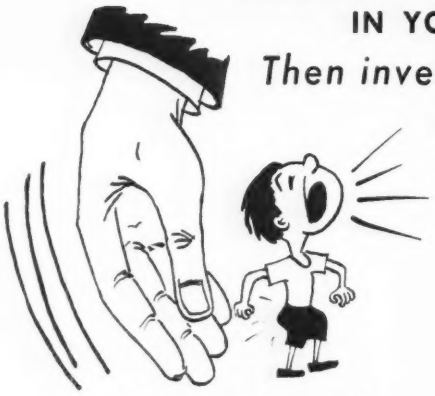
A Subsidiary of Pittsburgh Plate Glass Company • One Gateway Center, Pittsburgh 22, Pennsylvania

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York • St. Louis • Minneapolis • New Orleans Dallas • Houston • Pittsburgh • Philadelphia • San Francisco. IN CANADA: Standard Chemical Limited

HAVE YOU A "PROBLEM CHILD"

IN YOUR COMPOUNDING DEPARTMENT?

Then investigate these helpful "Factice" facts!



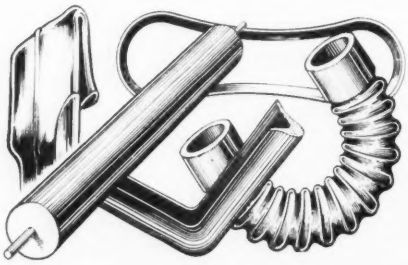
Neophax is

- compatible with Neoprene, synthetics, and crude rubber,
- aids in processing,
- improves extrusion, maintains die size,
- stabilizes mold dimensions,
- permits wide durometer range,
- yields ultimate plasticizing.

FACTICE®

Neophax®

Feel free to submit your problems to us. Just explain your difficulty, or describe the effect you wish to achieve. Without obligation, our laboratory will gladly make helpful recommendations. Data on request any time.



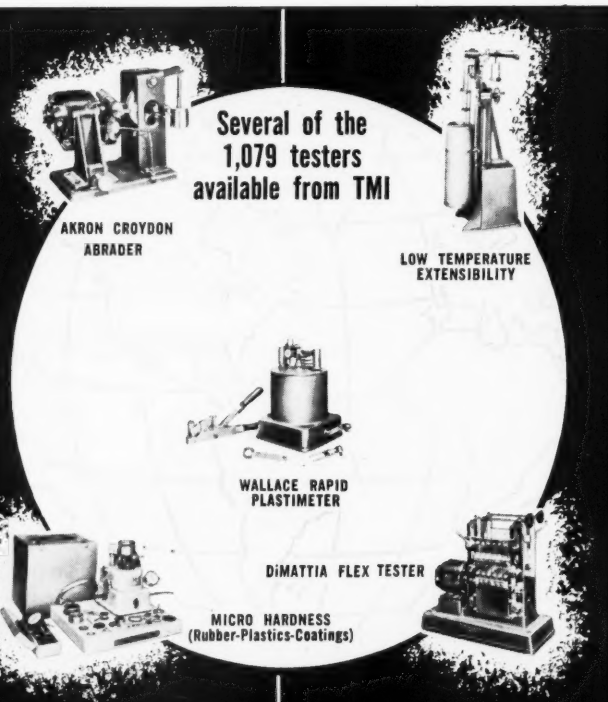
Factice
THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO., STAMFORD, CONN.

Look to...

tmi

America's leading Manufacturer & Distributor of Physical Testing Machines



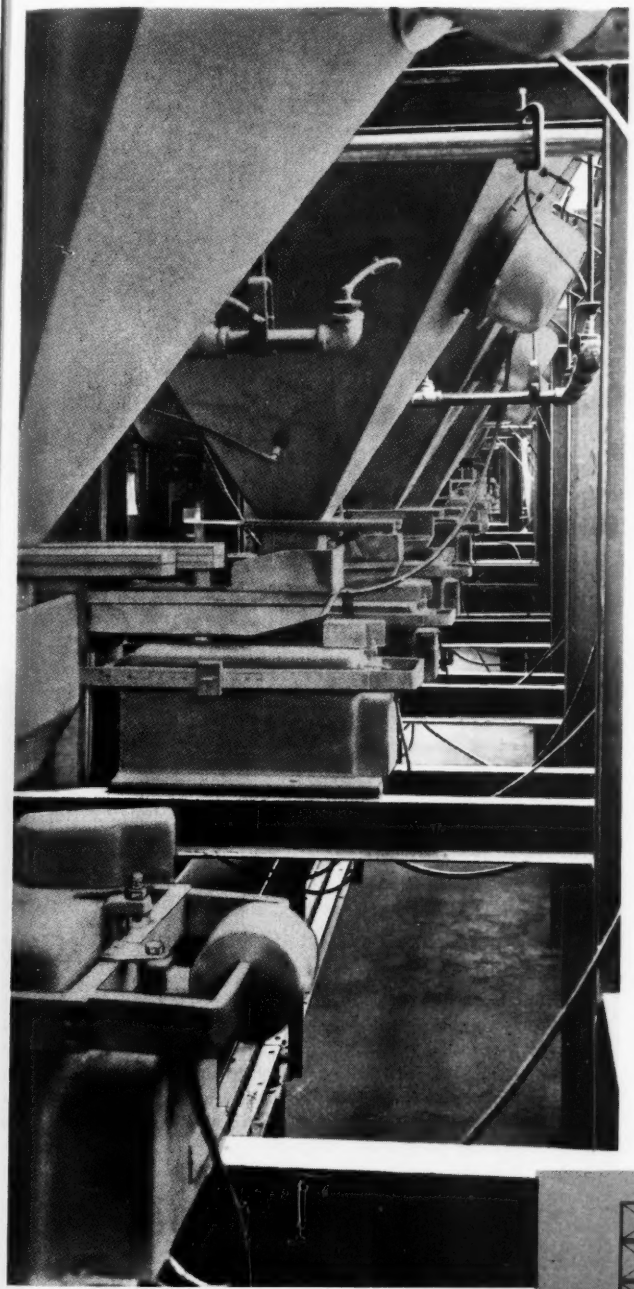
Write for data concerning all your testing equipment needs.

TESTING MACHINES INC.

72 Jericho Turnpike • Mineola, L. I., New York

The finest Test Equipment for ALL Industries

NEW EFFICIENCY for your Banbury mixer operation through automatic weighing and charging



Here is a typical small-plant setup for automatic weighing and charging of batch ingredients for a single Banbury® mixer. It consists of nine units for weighing and metering out ingredients used in small quantities, and three more units for flowable batch ingredients used in larger quantities. The conveyor receiving materials from the line of nine units discharges onto a shorter one running to the Banbury hopper.

When this equipment was installed and placed in operation, Banbury mixer production improved in batch uniformity and increased in rate, with less manual work than before. This is consistent with results obtained in a number of recent installations specially engineered by Farrel-Birmingham, incorporating the use of automatic weighing equipment manufactured by Glengarry Processes, Inc.

For the Banbury or battery of Banburys which may be in your plant, why not investigate the following advantages:

1. GREATER ACCURACY – For discharges weighing ten or more pounds, tolerances are plus or minus ½ ounce; for smaller quantities, they go as low as plus or minus 4 grams. This is far better than can be expected from skilled weighers.

2. INCREASED PRODUCTION – Weighing, conveying and charging can be timed to coincide with the fastest Banbury cycle. Delays between batches can be eliminated, thereby boosting mixer output.

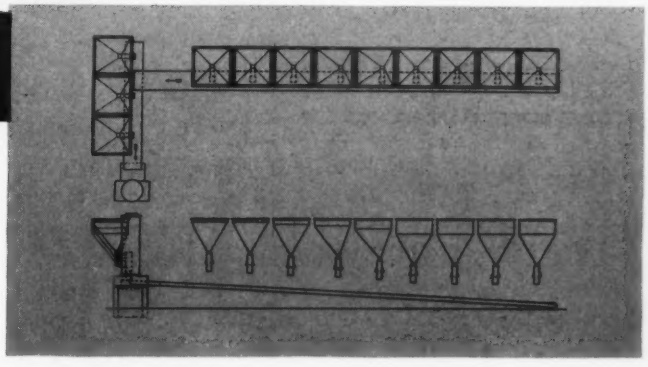
3. FEWER MAN HOURS – With automatic operation, compounders can be assigned to other plant jobs.

In plans for any single installation the extent of automation can be varied, and can include the automatic weighing and handling of all ingredients when the production setup includes pelletizing or dicing equipment. Centralized control can, if desired, include remote weight selection, or, going one step further, the complete system may be controlled by punch-card programming.

Contact Farrel-Birmingham for a preliminary discussion of your objectives.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, Akron, Chicago, Ann Arbor (Mich.), Los Angeles, Houston, Fayetteville (N. C.)
European Office: Piazza della Republica 32, Milano, Italy



ABOVE: Battery of nine Glengarry weighing units. Poise on the graduated beam of each unit must be set for the correct quantity to be weighed out.
RIGHT: Schematic drawing of automatic weighing and charging system.

FARREL®

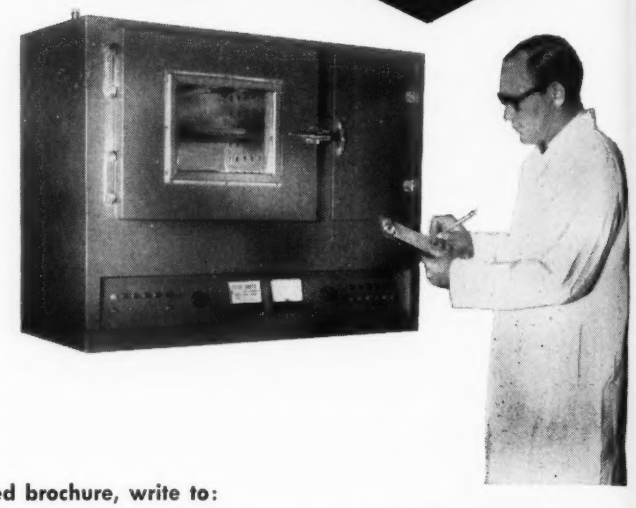
FB-1159

THE ANSWER

to Every OZONE Testing Problem

AUTOMATICALLY CONTROLLED OZONE TEST CHAMBER

OZONE TESTING OF MATERIALS SERVICE



OZONE TEST CHAMBERS

OREC 0300 series ozone test chambers are entirely automatically controlled with panel instrumentation directly indicating in pphm/volume the ozone concentration at which the test chamber is operating. OREC 0300 series provide ozone concentrations required by all ASTM Specifications, as well as all known Producer, Consumer, and Military Specifications.

OZONE TESTING SERVICE

Accelerated ozone test chamber testing and Outdoor ozone testing in the stable desert climate of Phoenix, Arizona are provided at economical rates. Tests are conducted according to ASTM or customer specifications.

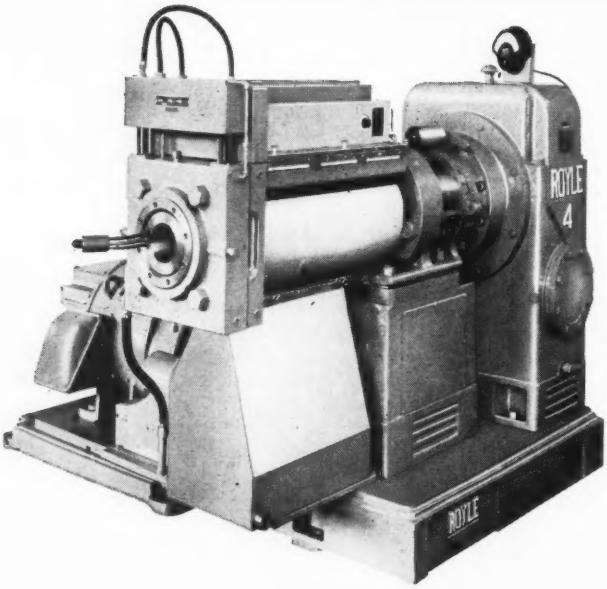
OTHER OZONE EQUIPMENT

Static and dynamic stretching apparatus for ozone testing, Laboratory Ozone Generators, Ozone Measurement Instrumentation, and Custom Ozone Apparatus.

For illustrated brochure, write to:

Ozone Research and Equipment Corporation

3861 W. Indian School Road — **Phoenix, Arizona**



ROYLE SPIROD®

For Maximum Versatility

Whether you are extruding plastics that require high processing temperatures or quick-curing compounds Royle Spirod —the all purpose, all-electric, completely automatic extruder —provides positive temperature control. This versatility is the result of combining a proportioning controlled system of high velocity evaporative cooling with tubular resistance heating to supply constant, accurately zoned processing temperatures.

Send for Bulletin Number 463

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

—PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England	Home Office	Akron, Ohio	Downey, Cal.	Tokyo, Japan
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter Co.	H. M. Royal, Inc.	Okura Trading Co., Ltd.
Hyde Park 2430 - 0456	SHerwood 2-8262	BLackstone 3-9222	TOpaz 1-0371	(56) 2130 - 2149

Call your HARWICK man

Your Harwick man often can anticipate problems before they start, and suggest appropriate remedies. He is technically trained, with wide experience in the closely related plastics and rubber industries. Call him in; he's as close as your phone.

From accelerators to resins, from colors to nutshell flour, Harwick Standard Chemical Company can supply your needs for most compounding materials. Save time by ordering from this single source.

your source for:

- COLORS
- PLASTICIZERS
- ACCELERATORS
- SYNTHETIC RESINS
- AND ALL OTHER COMPOUNDING MATERIALS FOR RUBBER AND PLASTICS

If You Would Like to Receive HARWICK Technical Bulletins, Write to:

Harwick Technical Representatives

AKRON, STadium 4-0481:
H. G. Greer — *K. H. Irons*
J. W. Shrontz — *C. R. Simpson*

ALBERTVILLE, 1485:
A. Koper

BOSTON, COpley 7-1860:
J. H. Fitz Gerald — *C. A. Meyer*

CHICAGO, LOngbeach 1-3195:
G. R. Huhn — *A. L. Robinson*

GREENVILLE, CEdar 5-0871

LOS ANGELES, MAdison 7-8588:
D. C. Maddy — *H. A. Trechter*

TRENTON, JUniper 7-0300:
R. J. Salyerds — *J. L. Weaver*

HARWICK STANDARD CHEMICAL CO.

60 SOUTH SEIBERLING STREET AKRON 5, OHIO

ALBERTVILLE, ALA. OLD GUNTERSVILLE HWY • BOSTON 16, MASS. 661 BOYLSTON ST • CHICAGO 25, ILLINOIS 2724 W. LAWRENCE AVE • GREENVILLE, S.C. P.O. BOX 746 • LOS ANGELES 21, CALIF. 1248 WHOLESALE STREET • TRENTON 9, N.J. 2595 E. STATE ST

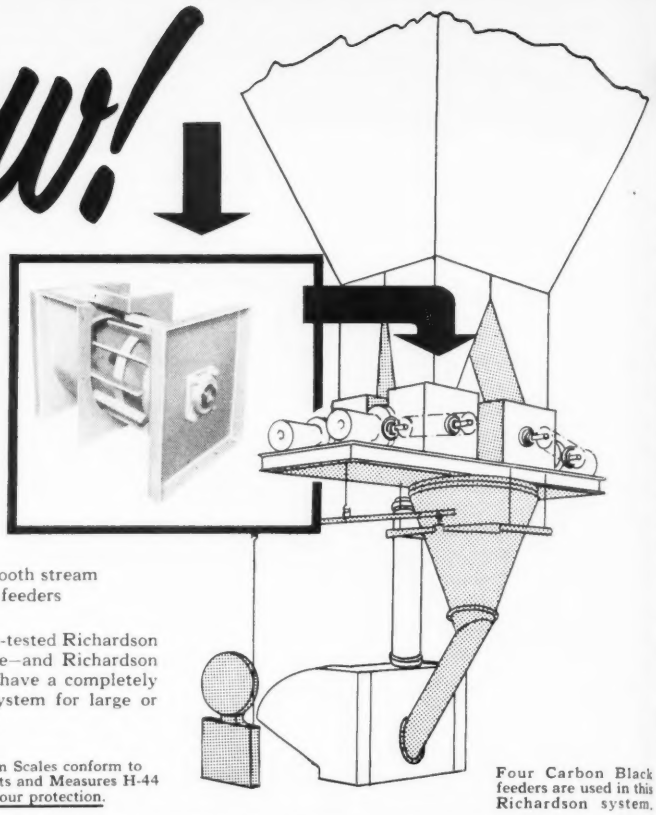
it's new!

Specialized Carbon Black Feeder Increases Weighing Accuracy for Better End Products

Richardson's latest contribution to the production of improved rubber products, at lower manufacturing costs, is this new-type Feeder that eliminates pulsations in delivery of carbon black to the scale. Located in-line with storage bin and scale, it . . .

- delivers at a rate of up to 20 cu. ft. per minute in smooth stream
- provides vastly improved accuracy over other rotary feeders
- allows maximum space economy

Add to this important new development the performance-tested Richardson Carbon Black automatic scale—the most accurate made—and Richardson automatic controls and recording equipment, and you have a completely automatic, efficient, *low cost* carbon black handling system for large or small rubber plants. Write today for full information.



Four Carbon Black feeders are used in this Richardson system.

Richardson Scales conform to U. S. Weights and Measures H-44 for your protection.

Richardson
MATERIALS HANDLING BY WEIGHT SINCE 1902

RICHARDSON SCALE COMPANY • CLIFTON, NEW JERSEY
Sales and Service Branches in Principal Cities
Also manufactured in Europe to U.S. standards

Specialization ALWAYS MEANS THE BEST...

Stewart Bolling makes a specialty of building a moderately priced line of laboratory and medium production sizes of 2-roll, 3-roll and 4-roll calenders . . . Herringbone drive and even speed gearing develop exceptional smoothness and accuracy. Both first cost and maintenance are outstandingly low. Calenders are available in a range of sizes from 8" x 16" through 22" x 60".

Write on your letterhead for Catalog 57-W for more information on production calenders. A special Catalog 58-W describes separately our line of laboratory equipment.

12" dia. by 32" face 3-roll calender—very compact assembly on 1-piece base. Roll adjustments are individually motorized.

STEWART BOLLING & COMPANY, INC.
3192 EAST 65th STREET • CLEVELAND 27, OHIO

• INTENSIVE MIXERS AND MILLS • CALENDERS • REFINERS • CRACKERS HYDRAULIC PRESSES • PUMP UNITS BALE SLITTERS • SPEED REDUCERS

Here's how UOP 88® and 288® work to protect your rubber products

The ozone damage problem is becoming progressively more acute, and not all antiozonant compounds can cope with the increasing ozone levels. Reported instances of deterioration of rubber goods due to ozone attack are often quite dramatic. In a high ozone concentration area an unprotected rubber article may actually show ozone damage in a few days. Where ozone levels are not so high, ordinary base stocks may crack in a year or less, even under static conditions.

Here's proof

Absolute protection of your rubber products is assured when you use UOP 88 or 288. At the UOP research laboratories, new antiozonant formulations are continually being tested in a variety of base stocks. In addition, many manufacturers have tested UOP antiozonants in their own laboratories and in use. One customer recently reported that in a test of UOP 88 in their base stock, the UOP antiozonant afforded complete protection for 230 hours of exposure under fixed conditions of strain of 50 pphm ozone. Another antiozonant used in the same recipe failed and the tire cracked after only 30 hours exposure, while the unprotected base stock cracked in 5 hours.

Select right antiozonant for best result

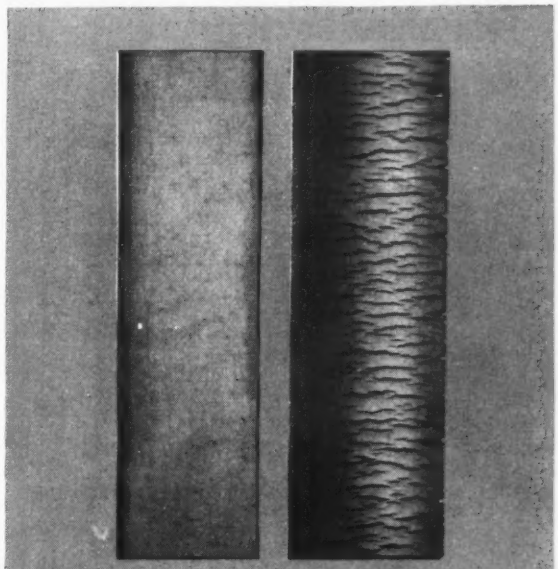
How long and how well antiozonants will work for you depends on the potency of the antiozonant and the various factors involved in compounding. One may give satisfactory protection under static conditions but fail under flexing. Another will provide mediocre protection in either static or dynamic service. UOP 88 and 288, however, provide excellent, tried and proven ozone protection to rubber goods in storage and in use.

At Universal Oil Products Company research scientists and technicians work constantly, testing and improving the UOP family of antiozonants.

What influences effectiveness

Effectiveness of antiozonant compounds may be influenced by these major factors:

1. Type of polymer, natural or synthetic.
2. Curing system.
3. Reinforcing agent.
4. Concentration of compounding ingredients, including the UOP antiozonant.
5. Conditions of use, including type of stress, ozone concentration, temperatures.



Rubber Strip Tests Show Effectiveness of UOP Antiozonants
The two rubber strips above were inserted in an ozone cabinet under identical, controlled conditions. The rubber in the sample shown on the right did not contain an antiozonant and reveals marked ozone damage. The SBR sample on the left contains two parts phr of a UOP antiozonant and reveals no ozone cracking after equal exposure.

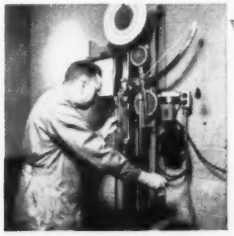
The concentration level of the UOP antiozonant must be related to other ingredients in the compounding recipe and to exposure conditions. Variations in type or concentration of ingredients reduce or enhance the final, lasting effectiveness of the antizonant.

About your product . . .

For one penny per pound of base stock of your product, UOP 88 or 288 antiozonants will provide years of ozone protection, prevent ozone cracking even under severe atmospheric exposure. UOP facilities and technical personnel are at your disposal for counseling on your particular antiozonant needs. Just phone, write or wire our Products Department.

Exaggerated conditions of stress and ozone concentration in the oven assure complete protection under any normal conditions.

In the Universal rubber laboratory, a rubber mill is used to incorporate experimental UOP antiozonants in various rubber polymers.



Every day we test a number of rubber recipes. The Scott Tester is used to measure physical properties of an experimental vulcanizate.

UOP 88® and 288®

RUBBER ANTIOZONANTS

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U. S. A.

For drying rubber and rubber-like materials

you get – **LESS DRYING TIME**

LESS "DRYING SPACE"

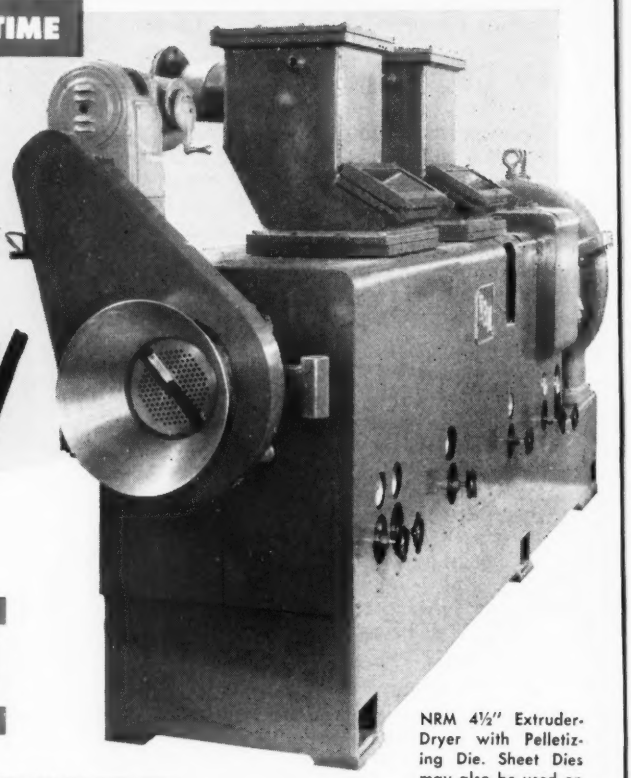
LESS CONTAMINATION

LESS MAINTENANCE

with the NEW

NRM

EXTRUDER-DRYER



NRM 4½" Extruder-Dryer with Pelletizing Die. Sheet Dies may also be used on the Extruder-Dryer.

The Extruder-Dryer is NRM's answer to the rubber industry's need for a faster, more reliable and more space-saving method of drying natural and synthetic rubbers, and dielectric rubber stocks. The machine is a single screw devolatilizing extruder with a three-section cylinder. Stock from the coagulator is fed into the first section where a new-type feed screw reduces moisture to as low as 5%. In the second section, stock is metered through an adjustable choke into a multi-stage devolatilizing area where remaining moisture is flashed off under vacuum. The third section forwards the rubber to the die.

The die may be a perforated plate with rotating cutter blade for pelletizing the dried stock, or a sheeting die.

The NRM Extruder-Dryer is designed to eliminate the complicated equipment of conventional rubber drying methods, their maintenance and contamination problems and excessive floor space requirements, yet provide highly efficient drying. The drying ability of the Extruder-Dryer is below ½ of 1% total moisture at compatible extrusion rates.

Let us discuss your rubber de-watering requirements and recommend the right type and size NRM Extruder-Dryer to do your work most efficiently and economically.

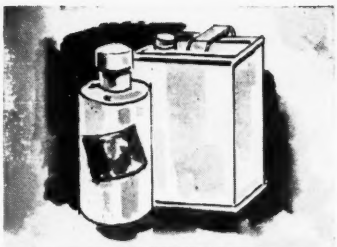
2984

NATIONAL RUBBER MACHINERY COMPANY

NRM

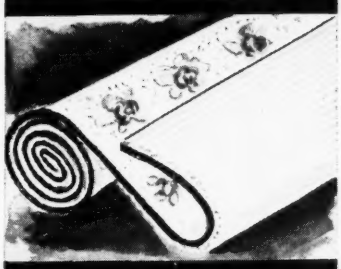
Creative Engineering

General Offices and Engineering Laboratories: 47 W. Exchange St., Akron 8, Ohio
WEST: S. M. Kipp, Box 441, Pasadena 18, Cal.
EXPORT: Gillespie & Company, 96 Wall St., New York 6, N. Y.

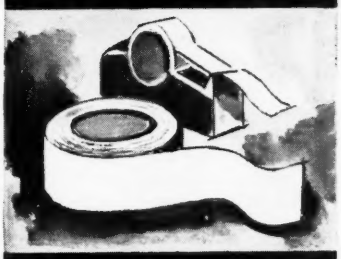


IN WAX EMULSIONS!

LATEX GOODS!



RUG BACKINGS!



PAPER PRODUCTS!

Make it Better with

MARBON

Marmix®

RESIN LATICES

- **EXTRA TOUGHNESS**
- **VERSATILE**
- **INCREASED TEAR RESISTANCE**

More and more manufacturers in various fields are turning to MARMIX for the essential qualities that make end-products more appealing, more practical. In *wax emulsions*, MARMIX contributes to increased film hardness and adhesion. When MARMIX is used in dipped *latex goods* your product has increased tear resistance, hardness and tensile strength; while in foamed latex goods, MARMIX offers improved dimensional stability plus such benefits as reduced shrinkage and a higher compression modulus. MARMIX also protects *rug backings* against warping or curling effects, and allows for higher pigment loading. *Paper products* employing MARMIX as a saturant or additive offer such important benefits as extra resistance to tear and delaminations, as well as greater protection against moisture, grease, oil and chemicals.

To assure a better product, and at lower cost —specify MARMIX.

Get the facts . . . WRITE TODAY FOR FULL DETAILS AND SAMPLES

PACESETTER IN

Marbon CHEMICAL

SYNTHETIC RESINS

Division of BORG WARNER • Washington, W. Va.

also represented by:

WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

TEXUS

SYNPOL®

BUTADIENE-STYRENE SYNTHETIC RUBBERS

HOT TYPES

SYNPOL	1000	1001	1002	1006	1007	1009	1012	1013	1061	1500
DESCRIPTION										
Emulsifier	Fatty Acid	Fatty Acid	Rosin Acid	Fatty Acid	Fatty Acid	Fatty Acid	Fatty Acid	Fatty Acid	Fatty Acid	Rosin Ac
Stabilizer	Staining	Slightly Staining	Staining	Non-Staining	Staining	Non-Staining	Non-Staining	Non-Staining	Non-Staining	Staining
Miscellaneous				Non-Discoloring	Glue Acid coagulated	Non-Discoloring Divinylbenzene Terpolymer	Non-Discoloring	Non-Discoloring Alum Coagulated High styrene	Non-Staining	
Carbon Black										
SPECIFICATIONS										
CHEMICAL										
Volatile Matter (Max.)	0.50	0.50	0.50	0.50	0.50	0.75	0.50	1.00	0.50	0.75
Ash (Max.)	1.50	1.50	1.50	1.50	0.50	1.50	1.50	1.25	1.50	1.50
Organic Acid	4.00–6.25	4.00–6.25	3.75–6.00	3.75–6.00	3.75–6.00	3.75–6.00	4.25–6.50	4.00–6.00	4.00–6.25	5.00–7.
Soap (Max.)	0.75	0.75	0.75	0.75	0 25	0.75	0.50	0.01	0.75	0.50
Bound Styrene	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	42.0–44.0	22.5–24.5	22.5–24
Stabilizer	1.00–1.75	1.00–1.75	1.00–1.75	1.25 added	1.00–1.75	1.25 added	1.25 added	1.25 added	1.25 added	1.00–1.
Carbon Black										
PHYSICAL										
Raw Viscosity	44–52	44–52	50–58	46–54	45–55	115–135	95–115	40–50	44–52	46–58
Cpd. Viscosity (Max.)	73	73	65	73	73	1600	120	73	73	73
Tensile psi (Min.)	2700	2500	2700	2500	2400	300	2900	2500	2500	3800
Elongation % (Min.)	550	500	550	500	500	400–700**	450	600	500	600
Modulus psi 25'	300–600	325–625	300–600	400–700	450–750	600–950**	550–1000	350–750	325–625	300–65
Modulus psi 50'	800–1150	750–1100	750–1100	825–1175	775–1125	850–1250**	1200–1700	775–1175	750–1100	800–12
Modulus psi 100'	1250–1650	1200–1600	1125–1525	1300–1700	1125–1525		1750–2250	1250–1750	1200–1600	1200–1
Water Soluble Ash % (Max.)					0.35					
Water Absorption mg./sq. cm. (Max.)					1.50					
Mill Shrinkage % (Max.)						25.0				
Oil—Parts										
Oil—Type										
REMARKS	A general purpose hot rubber adaptable to most black products where color is unimportant.	More resistant to staining and discoloring than 1002.	Higher tensile and lower modulus in cured compounds than 1000 or 1001. Slower curing.	General purpose, non-discoloring and non-staining polymer.	Glue acid coagulated staining polymer with relatively low water absorption, low ash, and good electrical properties.	A non-staining cross linked polymer. Use of small quantities with other type polymers reduces shrinkage and die-swell in calender and extrusion operations.	A high-Mooney polymer for solution applications.	A high styrene, non-staining and non-discoloring polymer.	Similar to 1006, with Polygard stabilizer.	A general pose cold rubber for where colo and staini unimporta
APPLICATIONS	Tires, molded and extruded mechanical goods, shoe soles and heels, and any other general purpose application.	Tires, molded and extruded mechanical goods, shoe soles & heels.	Tires, molded and extruded mechanical goods.	Light-colored and white products, such as white sidewall tires, shoe soles, floor tile, toys, hospital sheeting, sporting goods.	Wire and cable insulation, electrical tape, gaskets, hard rubber products, etc.	Where control of shrinkage is important. Footwear, wire & cable insulations, calendered goods, soles, heels. Can be used with Natural Rubber and Neoprene.	Asbestos sheet packing. Special types of adhesives and certain mechanical goods.	Calendered goods, closures, can sealants, adhesives and molded goods.	Light-colored & white products such as white sidewall tires, shoe soles, floor tile, toys, hospital sheeting, sporting goods.	Tires, ca back, mo and extru mechanic goods.

†Based on rubber hydrocarbon content *300% Elongation **Synpol 1009 Moduli @ 200% Elongation

HERE ARE THE 4 LATEST NEW SYNPOLS

SYNPOL 8000 Hot, high styrene (43 parts) • non-staining, non-discoloring premium rubber at regular price

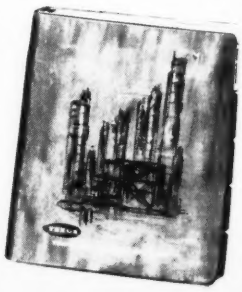
SYNPOL 8200 Extremely light-colored • non-staining, non-discoloring—37.5 parts pale naphthenic oil • low ash content

SYNPOL 8201 Light colored • 50 parts naphthenic oil • low ash content

SYNPOL 8253 Black Masterbatch • 60 parts FEF • 37.5 parts naphthenic oil • non-staining

COMPREHENSIVE TECHNICAL DATA FILE AVAILABLE

Please Write On Your Company Letterhead



Have you thoroughly considered SYNPOL?

- There are now 24 different grades of SYNPOL—a quality rubber to meet any product or process need.
- TEXUS offers the widest line of clear polymers in the industry.
- New SYNPOL ultra-dispersed black masterbatches are already commercially proven and available in full commercial quantities.
- The industry's most extensive warehousing operation assures when-you-want-it delivery that is unsurpassed.
- TEXUS technical service, backed by extensive basic and applied research programs, offers immediate, experienced assistance with your product or process problems.

Whatever your product, present or contemplated, whatever your process needs, if you want to be sure you are giving yourself every possible advantage, better consider SYNPOL thoroughly—now. For further information, technical literature, or to have a TEXUS Representative contact you at your convenience, simply pick up the phone and call collect. The number is MUrray Hill 9-3322 in New York.

	COLD TYPES			COLD OIL-EXTENDED TYPES					BLACK MASTERBATCHES		
061	1500	1502	1551	1703*	1707*	1708*	1711	1712	8150	8250	8251
Acid taining iscoloring	Rosin Acid Staining	Mixed Soap Non-Staining Non-Discoloring	Rosin Acid Non-Staining Non-Discoloring	Mixed Soap Non-Staining Non-Discoloring	Rosin Acid Non-Staining Non-Discoloring	Fatty Acid Non-Staining Non-Discoloring	Rosin Acid Staining	Mixed Soap Staining	Rosin Acid Staining	Mixed Soap Staining	Rosin Acid Staining
									Acid Coagulated	Acid Coagulated	Acid Coagulate
									50 pts. HAF Ultra-Dispersed	50 pts. HAF Ultra-Dispersed	75 pts. HAF Ultra-Disperse
											(Typ. Prod. Values)
-6.25	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.00	1.00	1.00
	1.50	1.50	1.50	1.50	1.50	0.50	1.50	1.50	0.50	0.50	0.50
-24.5	5.00–7.25	4.75–7.00	5.00–7.25	4.50–6.30	3.90–5.70	3.90–5.70	3.90–5.70	3.90–5.70	3.25-4.75	3.20-4.50	
	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.40	
dded	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5	22.5–24.5			
	1.00–1.75	1.25 added	1.25 added	1.25 added†	1.25 added†	1.25 added†	1.25 added†	1.25 added†	1.25 added 32.4-34.2	1.25 added† 27.2-29.9	1.25 added 33.9-36.6
										(Typ. Prod. Range)	
2	46–58	46–58	46–58	50–70	45–65	50–70	45–65	45–65	65-80	55-70	
25	73	73	73						3000	2900	
100	3800	3100	3600						350	500	
1600	600	575	600						1325-2125	300-900	
	300–650	350–650	300–650						1750-2650	650-1350	
	800–1200	775–1125	800–1200						2100-3100	900-1600	
	1200–1700	1250–1650	1200–1700								
						0.35					
						1.50					
				25 Naphthenic	37.5 Naphthenic	37.5 Naphthenic	37.5 Highly Aromatic	37.5 Highly Aromatic		25 Highly Aromatic	37.5 Highly Aroma
o 1006, gard	A general purpose cold rubber for use where color and staining is unimportant.	Non-discoloring and non-staining cold rubber. Higher physicals than 1006 and 1061.	A general purpose non-staining and non-discoloring cold rubber, based on recipe for 1500.	A general purpose non-discoloring, non-staining oil-extended polymer.	Similar to 1703. Emulsified with rosin soap rather than mixed soap.	Non-discoloring and non-staining polymer, low ash content and water absorption values, resulting in good electrical properties.	Similar to 1712, emulsified with rosin soap rather than mixed soap.	General purpose oil-extended polymer for use where color and staining is unimportant.	Rubber and Black are mechanically-mixed for ultra-dispersion; resulting in significantly improved physicals, with clean handling and substantial mixing economies.		
ed & ucts hite res, floor hos- ing, ods.	Tires, camelback, molded and extruded mechanical goods.	Light-colored & white products such as white sidewalls, white & light colored mechanicals, floor tile, hospital sheeting, toys, soles, heels, food conveyor belts.	For general use where non-staining characteristics are important.	Light-colored and white products; tires, mechanical goods, floor tile, shoe soles and heels, sporting goods and toys.	White sidewall tires, camelback, molded and extruded mechanical goods. Friction and skin coats. Molded shoe soles and heels.	Wire & cable insulation; certain electrical goods, coated fabrics, molded and extruded mechanicals, soles, heels, wringer rolls, floor tiles.	Tires and camelback. Molded and extruded mechanical goods.	Tires, camelback, molded and extruded mechanical goods. Wire and cable insulation.	Tires, camelback, shoe soles and heels, molded mechanical and sporting goods, wire and cable insulation, industrial rolls and wire coatings. Use of oil-extended grades 8250 and 8251 effects additional cost savings.		

*Improved light-colored, oil-extended polymers

TEXUS

TEXAS-U.S. CHEMICAL COMPANY

260 Madison Avenue, New York 16, N.Y. · MUrray Hill 9-3322

General Offices and Plants: Port Neches, Tex. TEXUS Research Center: Parsippany, N.J.

- *a highly reinforcing white pigment*
- *excellent resistance to scorch*
- *good dispersing characteristics*
- *non-toxic*

ZEOLEX 23

PHYSICAL PROPERTIES

pH	9.5-10.5
Form	Dry Powder
Specific Gravity	210
Screen Residue (325 mesh)	0.1% Maximum
Free Moisture (Maximum)	5%
Particle Size (millimicrons)	20-30
Oil Absorption (cc/100g)	130-140

Immediate shipments available from our Havre de Grace, Md., plant

HUBER

J. M. HUBER CORPORATION 630 THIRD AVE., NEW YORK 17, N. Y.

Manufacturers of: Channel Blacks • Furnace Blacks • Rubber Clays • Rubber Chemicals

For Rubber Reinforcing Pigments, Think of Huber

Wise Owls read Huber Technical Data. Ask to be put on our mailing list.

RUBBER WORLD
EDITORIAL

Need of Better Quality And Availability of Statistics

ACTING as spokesman for the statistical committee of The Rubber Manufacturers Association at its annual meeting in New York in November, Karl O. Nygaard, director of business research for The B. F. Goodrich Co., emphasized that if business management is going to be able to act quickly in situations of rapid change, it has to have reliable, up-to-date information on industry activity. He then went on to show that our major business indicators provided little advance warning of the 1957-58 recession in the rubber industry, owing mainly to (1) the nature of the recession itself, and (2) shortcomings of available statistical information.

It is with his second point that RUBBER WORLD *is most concerned because we think it involves need of a change in the method and extent of collection of business economic statistics both by government and industry, and possibly even a change in the policy of the RMA with regard to dissemination of some of its figures to the rubber and associated industries.*

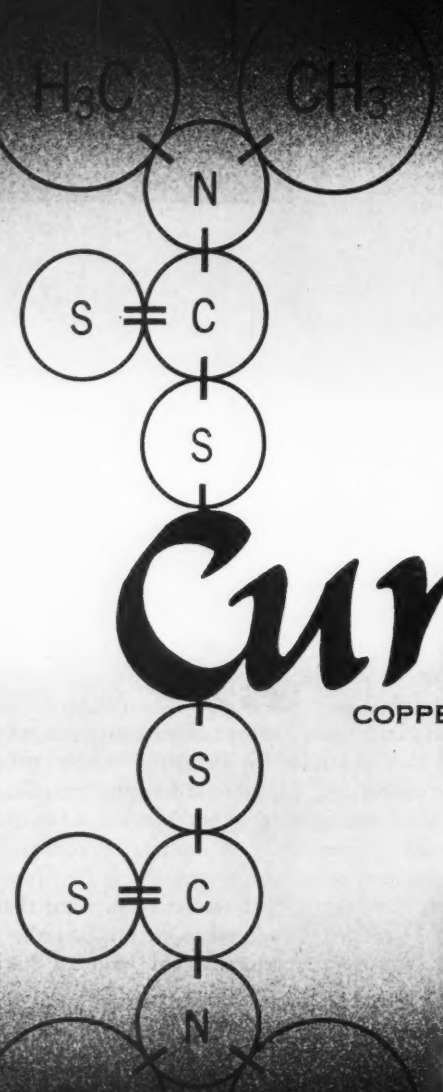
It is not possible in this editorial to explain all of the reasons for our position, but only to give one or two examples. Nygaard said that aside from the losses in original-equipment tires and other rubber products for new cars and trucks, the recession in the rubber industry may be traced to the decline in business capital outlays and to the switch from general business inventory accumulation to substantial inventory liquidation. The latest available information from the Department of Commerce at this writing (December 22) is preliminary figures for manufacturers' inventories for 20 industries for October, 1958, but in contrast to the other 19 industries, inventory figures for the rubber industry are marked "not available" both for September and October. Engineering construction awards were available through the week ended December 13, however, from the McGraw-Hill Publishing Co. the week of December 22.

Nygaard made another important point when he said that the trend in industrial rubber products' new orders and sales should be a most useful indicator of changes in general business conditions. Factual information on industrial rubber goods production, sales, and inventories is far from complete, however, and it was recommended that further research be undertaken to broaden the scope and improve the reliability of industry statistical information in this important field.

If the RMA statistical committee is given the go-ahead on this project, and if the figures collected prove to be the useful indicator anticipated, will they be made available generally to all interested companies and organizations? Unfortunately not, because according to present RMA policy this information will be restricted to members only.

RUBBER WORLD *suggests that the RMA review its position with regard to its responsibility to all companies and organizations interested in rubber industry statistics and that the Department of Commerce do likewise. The returns not only in dollars, but in intangible benefits might be greater to the RMA and its member companies if more of its figures were made available generally.*

R. G. Seaman
EDITOR



Cumate*

COPPER DIMETHYLDITHIOCARBAMATE

ultra accelerator

for SBR and Butyl vulcanization

Effective for fast vulcanization with good processing safety. Try these curing systems in your compounds.

CUMATE *	**.2–.75**	**1**

* REGISTERED U. S. TRADE MARKS

R. T. Vanderbilt Co., INC.

230 PARK AVENUE • NEW YORK 17

RUBBER WORLD

Properties of Elastomers Up to 550° F.—I[1]

By F. M. SMITH
Firestone Tire & Rubber, Akron, O.

RUBBER compounds, both synthetic and natural are being required to withstand ever-increasing temperatures in today's industrial and military applications. This requirement necessitates not only a knowledge of the heat resistance of current compounded elastomers, but also the development of increasingly higher heat-resistant compounds for use in tires, gaskets, hose, seals, and other elastomeric components.

A survey of the literature for the past 15 years revealed that several investigators had measured physical properties of elastomers at elevated temperatures. Van Raamsdonk (1)[2] in 1955 reviewed the literature on properties of compounded elastomers at temperatures up to 248° F. Most of this work was done by Boonstra, (2, 3) who found that the best retention of properties at temperatures up to 248° F. was given by *Hevea*, butyl rubber, SBR, and NBR and neoprene in that order. Braendle *et al.* (4) measured the tensile strength of SBR at 300° F. Peter (5) measured physical properties of silicone rubber, butyl rubber, NBR, and neoprene at temperatures as high as 392° F. DeFrancesco *et al.* (6, 7) measured the tensile strength of silicone rubber at 400° F.; Doede and Panagrossi (8) measured a titanium dioxide-filled silicone rubber at 482° F.

Very recently Konkle, McIntyre, and Fenner (9) made an extensive study of physical properties of elastomers, both with respect to temperature range and to variety of elastomers studied. *Hevea*, SBR, neoprene, butyl rubber, NBR, polyacrylic rubbers, Fluoro-Rubber 1F4, Acrylon BA-12, Hypalon, and silicone rubbers were tested at temperatures up to 482° F. (250° C.) with a Scott[3] IP4 inclined plane tensile

[1]Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 15, 1958. A major portion of the work reported in this paper was conducted under U. S. Air Force Contract Nos. AF33(616)-3108 and AF33(616)-3953, which was administered under the direction of the Materials Laboratory, Wright Air Development Center, Dayton, O.

[2]Numbers in parentheses refer to Bibliography items at the end of this article.

[3]Scott Testers, Inc., Providence, R. I.

The Author

Floyd M. Smith, compounder, research compounding group, Firestone Tire & Rubber Co., Akron, O., obtained his B. S. degree in chemical engineering from Purdue University in 1949.

Following his graduation he joined Firestone. Starting as a chemical engineer in the research pilot plant, he became head of the pilot plant in 1952. In 1954 he joined the research compounding group as a compounder. In this capacity Mr. Smith has been actively engaged in the investigation of the heat resistance of rubber compounds, working since 1954 under contracts initiated by the Materials Laboratory, Wright Air Development Center.

He is a member of the American Chemical Society and its Division of Rubber Chemistry, the American Institute of Chemical Engineers, and the Akron Rubber Group.

TABLE 1. COMPOUNDING RECIPES

A. Hevea	
Smoked sheet[a]	100
HAF black	50
Zinc oxide	3
Stearic acid	3
Antioxidant	1.6
Sulfur	2.6
Pine tar	3
Santocure[b]	0.5
Cure: 60/280° F.	

C-1. Butyl Rubber	
Enjay Butyl 325[d]	98
Brominated Butyl[e]	2
HAF black	60
Stearic acid	1
Amberol ST-137[f]	12
Cure: 90/320° F.	

C-3. Butyl Rubber	
Enjay Butyl 325	100
MPC black	50
Stearic acid	0.5
Polyac	0.5
Zinc oxide	20
Sulfur	2
Vistanex	5
Red lead	10
Dibenzo GMF[j]	6.4
Cure: 30/320° F.	

E. Hypalon	
Hypalon S-2[n]	100
HAF black	20
Magnesium oxide	30
Staybelite resin[o]	2.5
Tetrone A[p]	1
Cure: 45/280° F.	

G. Acrylate Rubber: Acrylon EA-5	
Acrylon EA-5[r]	100
HAF black	50
Stearic acid	1.25
Triethylene-tetramine	2
Tetrone A	2
Cure: 20/310° F.	

I. Fluoro-Rubber 1F4	
Fluoro-Rubber 1F4[u]	100
HAF black	35
Wax	1
Triethylene-tetramine	1.25
Sulfur	1
Cure: 30/310° F.	
Post-cure: 24 hrs. @ 300° F.	

B. SBR (LTP)	
FR-S 1500[c]	100
HAF black	50
Zinc oxide	3
Stearic acid	2
Oil	8
Antioxidant	0.6
Sulfur	2.0
Santocure	1.2
Cure: 60/280° F.	

C-2. Butyl Rubber	
Enjay Butyl 325	100
MPC black	50
Stearic acid	0.5
Polyac[g]	0.5
Zinc oxide	25
Sulfur	2
Tellurac[h]	3
Vistanex[i]	5
Lead dioxide	5
Cure: 30/320° F.	

D. Neoprene	
Neoprene GRT[k]	100
MPC black	50
Stearic acid	0.5
Magnesia	4
Zinc oxide	5
Antioxidant	2
Altax[m]	0.75
Cure: 45/280° F.	

F. NBR	
Butaprene NL[q]	100
HAF black	50
Zinc oxide	3
Altax	1
Sulfur	2.5
Dibutyl phthalate	10
Cure: 40/320° F.	

H. Acrylate Rubber: Hycar 4021	
Hycar 4021[s]	100
HAF black	50
Stearic acid	1
Trimene Base[t]	2.5
Sulfur	0.5
Cure: 30/310° F.	

J. Vyram N-5400	
Vyram N-5400[v]	141
Stearic acid	3
Magnesia	20
Lead peroxide	5
Cure: 60/330° F.	

K. Thiokol ST	
Thiokol ST[w]	100
GMF (33%)[x]	4.5
Zinc oxide	0.5
Stearic acid	3
HAF black	50
Cure: 20/280° F.	

L-2. Polyurethane (Heat-Stable)	
Same as L-1 except polymer based on butanediol pentanediol adipate.	
Cure: 50/300° F.	

M-1. Silicone Rubber	
Silastic 916 U[ad]	100
Di-*t*-butyl peroxide (20%)	3
Press cure: 15/300° F.	
Post-cure:	
1 hr. @ 300° F.	
8 hrs. @ 480° F.	

N. Viton A	
Viton A[af]	100
FEF black	20
Magnesia	15
HMDAC[ag]	1.5
Press cure: 20/280° F.	
Post-cure:	
1 hr. @ 300° F.	
16 hrs. @ 400° F.	

L-1. Polyurethane (Conventional)	
Butaprene E[y]	100
HAF black	30
Processing Aid	1
DiCup 40-C[z]	6.25
Cure: 50/300° F.	

L-3. Adiprene C (Polyether)	
Adiprene C[aa]	100
HAF black	25
Activator A[ab]	0.4
Sulfur	1
Altax	4
Captax[ac]	1
Cure: 30/300° F.	

M-2. Silicone Rubber	
Silastic 50[ae]	100
Press cure: 10/250° F.	
Post-cure:	
1 hr. @ 300° F.	
8 hrs. @ 480° F.	

O-1. Kel-F Elastomer 3700[ah]	
Polymer	100
Zinc oxide	10
Dyphos[ai]	10
Benzoyl peroxide	1.5
Press cure: 15/300° F.	
Post-cure:	
16 hrs. @ 300° F.	

O-2. Kel-F Elastomer 5500[ah]	
Same as O-1	
Press cure: 15/300° F.	
Post-cure: 16 hrs. @ 300° F.	

[a]No. 1 RSS, Firestone Tire & Rubber Co., Akron, O.
[b]N-cyclohexyl-2-benzothiazolesulfenamide, Monsanto Chemical Co., rubber chemicals department, Akron.
[c]LTP SBR, Firestone Tire & Rubber Co., synthetic rubber and latex division, Akron.
[d]Isobutylene-isoprene copolymer (1.9-2.3 mol% isoprene), Enjay Co., Inc., New York, N. Y.
[e]Hycar 2202, B. F. Goodrich Chemical Co., Cleveland, O.
[f]Modified phenolic resin, Rohm & Haas, Philadelphia, Pa.
[g]Poly-para-dinitrosobenzene, 25%, E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.
[h]Tellurium diethyldithiocarbamate, R. T. Vanderbilt Co., New York.
[i]Polyisobutylene, Enjay.
[j]Dibenzoyl quinone dioxime, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
[k]General-purpose polychloroprene, Du Pont elastomer chemicals department.
[m]2,2′-Dithiobisbenzothiazole, Vanderbilt.
[n]Chlorosulfonated polyethylene, Du Pont elastomer chemicals department.
[o]Hydrogenated wood rosin, Hercules Powder Co., Inc., Wilmington.
[p]Bis(1-piperidylthiocarbonyl) tetrasulfide, Du Pont elastomer chemicals department.
[q]Acrylonitrile-butadiene synthetic rubber (28-33% nitrile), Firestone synthetic rubber and latex division.
[r]Ethylacrylate and acrylonitrile copolymer, Borden Co., chemical division, New York.
[s]Ethylacrylate and 2-chloroethylvinyl ether copolymer, Goodrich Chemical.
[t]Ethyl chloride, formaldehyde, and ammonia reaction product, Naugatuck Chemical.
[u]Poly (1,1-dihydroperfluorobutyl acrylate), Minnesota Mining & Mfg. Co., commercial chemical division, St. Paul, Minn.
[v]Poly (2-cyanoethoxyethyl acrylate), 100 phr.; Dixie 5 carbon black, 30 phr.; Cab-O-Sil, 10 phr.; Oleic acid, 1 phr.—masterbatch; Monsanto Chemical Co., St. Louis, Mo.
[w]Polysulfide synthetic rubber, Thiokol Chemical Corp., Trenton, N. J.
[x]Para-quinone dioxime, 33%; clay, 67%; Naugatuck Chemical.
[y]Experimental saturated polyester polyurethane, Firestone.
[z]Dicumyl peroxide, 40%; calcuim carbonate, 60%; Hercules.
[aa]Unsaturated polyether polyurethane, Du Pont elastomer chemicals department.
[ab]Form of complex of benzothiazyl disulfide (MBTS) and zinc chloride, Du Pont elastomer chemicals department.
[ac]Mercaptobenzothiazole, Vanderbilt.
[ad]Uncatalyzed, high-strength silicone rubber, Dow Corning Corp., Midland, Mich.
[ae]General-purpose silicone rubber compound, Dow Corning.
[af]Hexafluoropropylene and vinylidene fluoride copolymer, Du Pont elastomer chemicals department.
[ag]Hexamethylenediamine carbamate, Minn. Mining.
[ah]Chlorotrifluoroethylene and vinylidene fluoride copolymer, Minn. Mining
[ai]Dibasic lead phosphite, National Lead Co., New York.

Properties of Elastomers Up To 550° F.

In order to determine the heat resistance of presently available materials, 19 elastomer compounds were subjected to a series of laboratory tests which would give an indication of the high-temperature serviceability of these compounds. Tensile properties at elevated temperatures both before and after aging eight hours at the test temperature, resistance to short-term (eight-hour) aging, Shore A hardness, tear strength, rebound resilience, and permeability to air were all measured at room and elevated temperatures.

Silicone and fluorocarbon rubbers were outstanding in retention of tensile properties after oven aging in air. Tensile strength of all elastomers decreased with increasing test temperatures. Highly unsaturated polymers, e.g., *Hevea* and SBR, suffered additional loss of tensile strength when aged eight hours at the test temperature; others, such as silicone rubber or Viton A, were essentially unaffected. Ultimate elongation of several polymers were extremely low when they were tested at 350° F. after aging. Superior tear resistance was shown by *Hevea* and neoprene compounds at temperatures up to 400° F.

Most compounds increase in Shore A hardness after aging because of continued cross-linking or oxidation; however, some butyl rubber and polyurethane compounds softened in the 400° F. range. SBR and silicone rubber maintained the most consistent hardness after aging up to 400° F. A falling ball rebound test, adapted for measuring resilience over the —40 to +500° F. range, indicated that silicone rubber and *Hevea* had the best balance of resilience at those temperatures.

Permeability to air measurements at temperatures up to 350° F. showed silicone rubber and Fluoro-Rubber 1F4 to be the least permeable.

Although no single laboratory test or even a series of laboratory tests can predict the actual behavior of any compound under actual service conditions, a study of the data presented in this paper should serve as a guide for the limitations and capabilities of the elastomers which were tested.

tester. Of the organic elastomers, Acrylon BA-12 had the best retention of tensile properties above 300° F. Silicone rubber retained a greater percentage of its original tensile strength than did the Acrylon BA-12 at all temperatures and showed a more linear decrease in stress-strain properties with increasing temperature.

The object of the present study was to evaluate, under contract with the Materials Laboratory of Wright Air Development Center, the heat resistance of compounds of currently available elastomers at temperatures up to 550° F. Elastomers tested were *Hevea*, SBR, butyl rubber, Hypalon, neoprene, NBR, acrylate rubbers, Fluoro-Rubber 1F4, Thiokol, polysulfide rubber, polyurethanes, silicone rubber, Kel-F Elastomer, and Viton A.

The laboratory properties which would indicate the high-temperature serviceability of compounds—particularly for aircraft tires—were considered to be stress-strain properties at elevated temperatures both before and after aging eight hours at the test temperature, resistance to short-term (eight-hour) aging, Shore A[4] hardness, tear strength, rebound resilience, and permeability to air. The knowledge gained of the high-temperature capabilities and limitations of these elastomers should assist designers in making the best use of materials currently available and should guide those working to develop new compounds.

The optimum cure for one or more compounds of each elastomer was determined before the complete series of tests started. Most of the recipes appearing in Table 1 were based on formulae appearing in the technical literature of suppliers of the polymers and upon information available from studies made in this laboratory. Details of testing methods and equipment will be postponed until the end of this paper.

Discussion of Results

Effect of Eight-Hour Air Aging on Room-Temperature on Tensile Properties

The extent to which an elastomer compound retained its original stress-strain properties after being exposed to high temperatures for eight hours in circulating air was used as one measure of its heat resistence. The eight-hour aging period was chosen arbitrarily as an interval several times longer than an aircraft tire would be exposed to the high skin temperatures of a supersonic plane, or longer than the period of extreme heat radiating to a tire from the brake drum after a high-speed landing.

The elastomers tested are listed in Table 2 in order of their resistance to heat aging as determined by the temperature [comparison temperature (C.T.), °F.] at which 25% loss in room-temperature tensile strength occurred. Of the polymers tested, the silicone rubbers, Viton A, and Kel-F Elastomer were most resistant to this type of aging. Compounds of these three elastomers normally require post-cures at 300-480° F. to develop optimum properties.

The acrylate rubbers, including the fluoroacrylate

[4]Shore Instrument & Mfg. Co., Inc., Jamaica 35, N. Y.

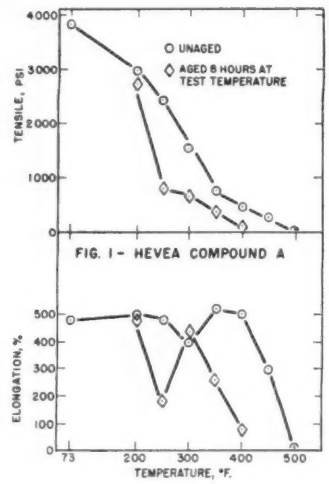


FIG. 1 - HEVEA COMPOUND A

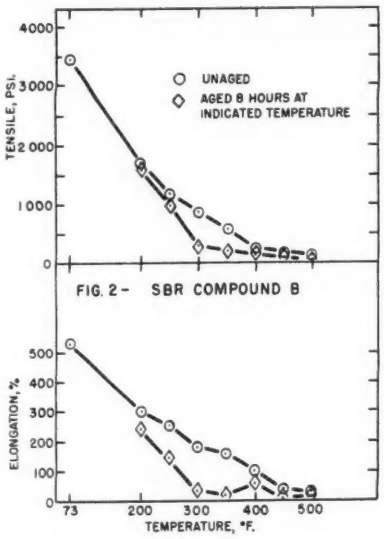


FIG. 2 - SBR COMPOUND B

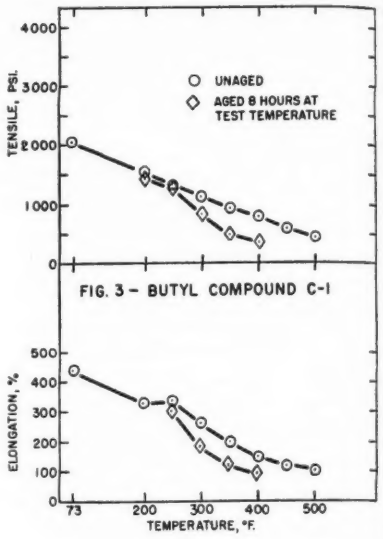


FIG. 3 - BUTYL COMPOUND C-1

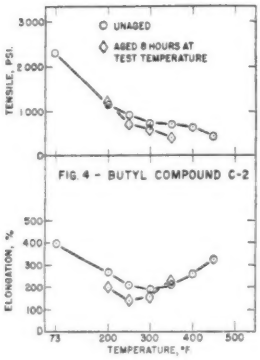


FIG. 4 - BUTYL COMPOUND C-2

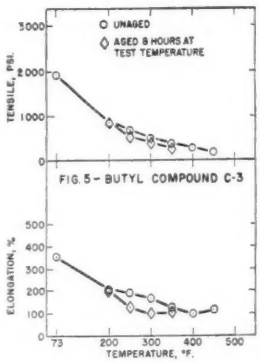


FIG. 5 - BUTYL COMPOUND C-3

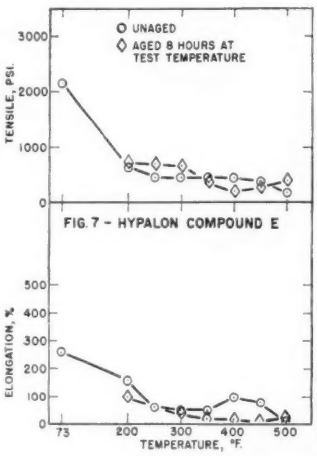


FIG. 7 - HYPALON COMPOUND E

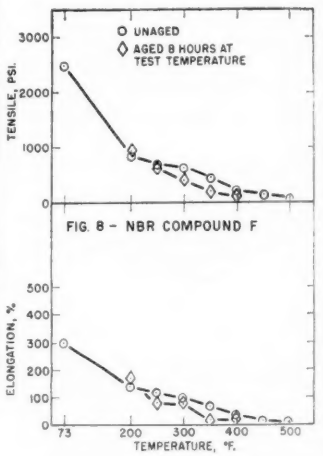


FIG. 8 - NBR COMPOUND F

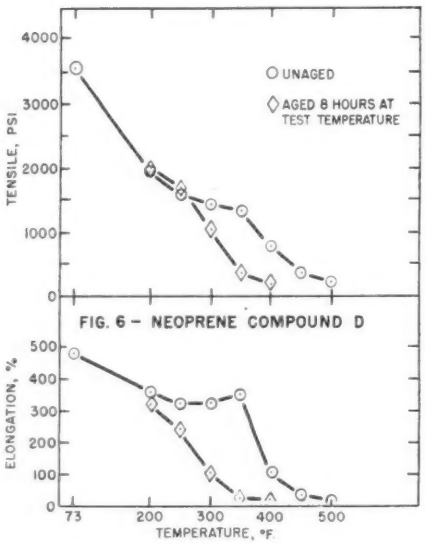


FIG. 6 - NEOPRENE COMPOUND D

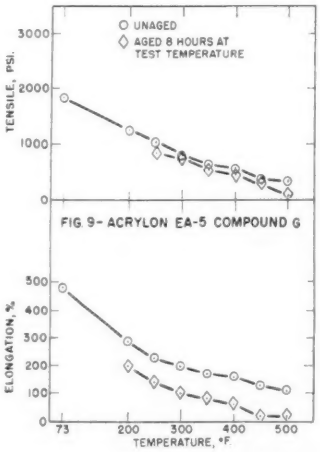


FIG. 9 - ACRYLON EA-5 COMPOUND G

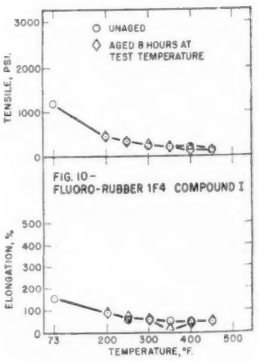
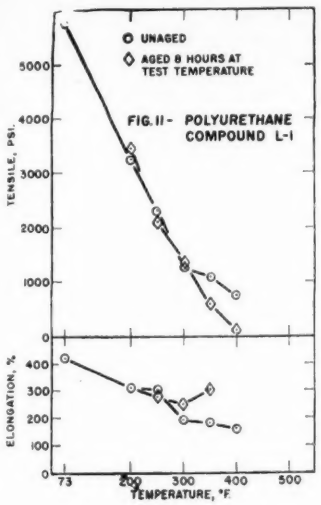
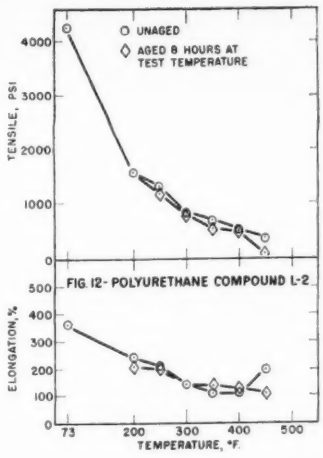
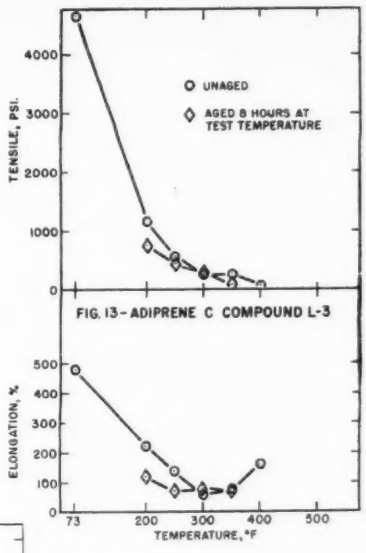


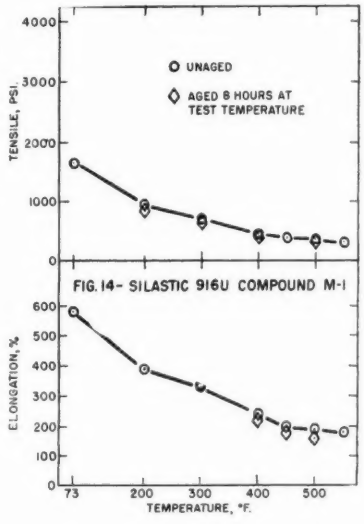
FIG. 10 - FLUORO-RUBBER 1F4 COMPOUND I

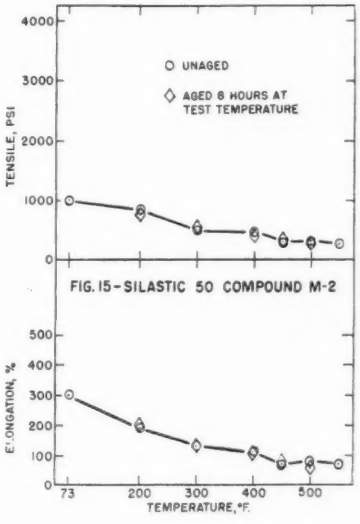
Tensile properties of unaged and aged compounds: Fig. 1. *Hevea* (A); Fig. 2. SBR (B); Fig. 3. Butyl Rubber (C-1); Fig. 4. Butyl Rubber (C-2); Fig. 5. Butyl Rubber (C-3); Fig. 6. Neoprene (D); Fig. 7. Hypalon (E); Fig. 8. NBR (F); Fig. 9. Acrylon EA-5 (G); Fig. 10. Fluoro-Rubber 1F4 (I)

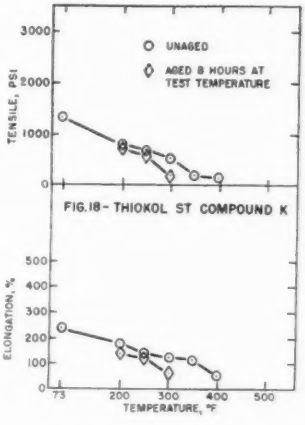


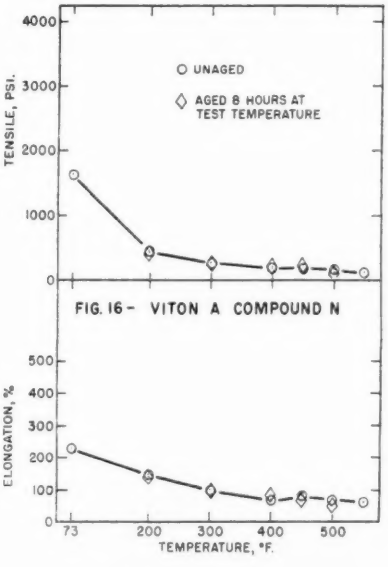


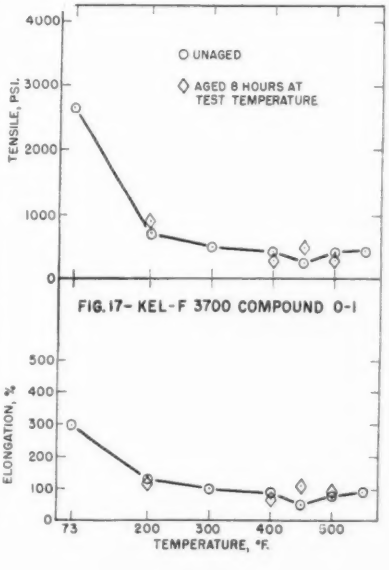












Tensile properties of unaged and aged compounds: Fig. 11. Polyurethane (L-1); Fig. 12. Polyurethane (L-2); Fig. 13. Adiprene C (L-3); Fig. 14. Silastic 916 U (M-1); Fig. 15. Silastic 50 (M-2); Fig. 16. Viton A (N); Fig. 17. Kel-F 3700 (O-1); Fig. 18. Thiokol (K)

TABLE 2. SHORT-TERM AGING RESISTANCE OF ELASTOMER COMPOUNDS

Aging period: 8 hours

Basis for Comparison: Temperature at which 25% loss in room temperature tensile strength occurs (Comparison Temperature, C. T., °F.)

	Compound	C. T. °F.
M-2	Silastic 50	>550
N	Viton A	>550
M-1	Silastic 916 U	535
O-1	Kel-F 3700	535
G	Acrylon EA-5	425
H	Hycar 4021	395
I	Fluoro-Rubber 1F4	385
L-2	Polyurethane	350
E	Hypalon	345
C-1	Butyl rubber	335
C-2	Butyl rubber	325
C-3	Butyl rubber	310
D	Neoprene GRT	310
L-3	Adiprene C	300
K	Thiokol ST	285
B	SBR (FR-S 1500)	275
F	NBR Rubber	215
A	*Hevea*	215
J	Vyram N-5400	Embrittled before loss

(Fluoro-Rubber IF4), Hypalon, and neoprene, continued to cross-link during aging. As a result, elongation decreased much faster than tensile strength, thus somewhat modifying the good retention of the latter.

Three types of polyurethane polymers were tested. L-1 was a conventional saturated polyester polyurethane (Butaprene E). L-2 was a more heat-stable polyester polyurethane based on butane-diolpentanediol adipate. L-3 was an unsaturated polyether polyurethane (Adiprene C). The heat stable L-2 had lower original tensile strength, but resisted degradation on heating better than the conventional saturated polyester polyurethane made from shorter chain length glycols, or the unsaturated, sulfur-cured Adiprene C.

Three butyl rubber compounds were tested. C-1 compound was cured with a phenol dialcohol (10) (Amberol ST-137) and had better short-term aging resistance than compound C-2 cured with sulfur and accelerators, or compound C-3 having a combination quinone and sulfur cure. The butyl polymer having the highest degree of unsaturation (Enjay Butyl 325) was used in all three compounds.

Copolymers of butadiene with styrene or acrylonitrile had better retention of tensile strength than had *Hevea* after the short-term aging cycle; however, at most temperatures, *Hevea* retained higher elongations than did SBR or NBR. A special oil-resistant NBR rubber compound (11) containing 100 phr. magnesia (not shown) had a comparison temperature rating of 340° F. compared with 215° F. for a more generally useful black-reinforced compound.

Tensile Properties at Elevated Temperatures

In the previous investigation of short-term aging resistance, tensile properties were measured at room temperature. As a second means of determining the heat resistance of elastomers, tensile properties of 21 compounds were measured at temperatures ranging from 200 to 500° F. Regardless of the initial room-temperature tensile strength, it is often the strength at elevated temperatures that determines whether one compound fails while another does not. The stress-strain data are tabulated in Table 3 and plotted for more visual presentation of the data in Figures 1-18.

Considering the loss in tensile strength caused by heat alone (the unaged tensile strength curves in Figures 1-18), three general types of behavior were noticed. The first group had high tensile strength at room temperature, but lost that strength rapidly as the compound was heated. This group would include *Hevea* (Figure 1), polyurethanes (Figures 11, 12, 13), neoprene (Figure 6), SBR (Figure 2), and NBR (Figure 8).

A second group, including butyl rubber (Figures 3, 4, 5), silicone rubber (Figures 14, 15), the acrylates (Figure 9), Fluoro-Rubber 1F4 (Figure 10), and Thiokol ST (Figure 18), was characterized by lower tensile strength at room temperature and a lower percentage loss in strength with increasing test temperatures.

In the third classification the tensile strength dropped sharply at 200-250° F., but had much less loss thereafter. Hypalon (Figure 7), Kel-F Elastomer (Figure 17), and Viton A (Figure 16) came under this category.

The rubbers possessing the highest tensile strengths at 400° F. and above are in the second and third classifications; these were butyl rubber, acrylates, fluorocarbon rubbers, and silicone rubbers.

The aged tensile strength curves shown in Figures 1-18 illustrate that an additional loss in strength may be expected for some polymer compounds if aged at high temperatures. The vertical distance between circles (for unaged values) and diamonds (for aged values) at any temperature must be regarded as the net effect of aging. If this distance is great, aging contributes greatly to the loss in tensile strength.

Hevea (Figure 1) and SBR (Figure 2) are most affected by aging. Little effect due to aging at elevated temperatures was noted for silicone rubbers (Figures 14, 15), Viton A (Figure 16), Kel-F Elastomer (Figure 17), and Fluoro-Rubber 1F4 (Figure 10) as shown by the two curves practically coinciding. The other elastomers fall between these two extremes.

The ultimate elongation behavior of elastomer compounds varied somewhat, as a study of the curves will show. *Hevea* and neoprene retained decidedly higher elongations (before aging) at intermediate temperatures than did any other compounds. Those polymers which were least affected in retention of ultimate elongation at high temperatures after aging were silicone rubbers, fluorocarbon rubbers, and the heat stable polyurethane (L-2) (Figure 12).

Variation of Elastomer and Compound and Elevated-Temperature Tensile Properties

Three cure variations of Enjay Butyl 325 were con-

TABLE 3. SUMMARY OF TENSILE PROPERTIES OF ELASTOMER COMPOUNDS AT ELEVATED TEMPERATURES BEFORE AND AFTER HEAT AGING

Tests: Tensile strength (T) in psi. and % elongation at break (E), measured at temperatures shown. All samples, both aged and unaged, were allowed to come to equilibrium temperature prior to actual test

			Heat-aging period: 8 hours at temperatures shown															
Aging temp., °F.:			—	—	200	—	250	—	300	—	350	—	400	—	450	—	500	—
Test temp., °F.:			73	200	200	250	250	300	300	350	350	400	400	450	450	500	500	550
Compound	Elastomer	Test																
A[a]	*Hevea*	T	3850	2980	2730	2460	800	1530	690	770	400	500	125	270	—	20	—	—
		E	480	500	480	480	180	400	440	520	260	500	80	300	—	10	—	—
B[a]	SBR (LTP) Rubber	T	3475	1680	1625	1190	990	890	270	590	220	260	170	200	100	140	60	—
		E	530	300	240	250	140	180	30	160	20	100	60	40	10	30	20	—
C-1[a]	Butyl Rubber	T	2050	1550	1470	1320	1270	1140	850	940	500	790	360	600	—	440	—	—
		E	440	330	330	340	300	260	180	200	120	150	90	120	—	100	—	—
C-2[b]	Butyl Rubber	T	2325	1170	1240	930	730	750	600	710	410	640	—	440	—	—	—	—
		E	400	270	200	210	140	190	160	210	230	260	—	330	—	—	—	—
C-3[b]	Butyl Rubber	T	1925	860	870	690	520	500	400	380	260	290	—	170	—	—	—	—
		E	360	210	200	190	130	170	100	130	110	100	—	120	—	—	—	—
D[a]	Neoprene (Type GRT)	T	3550	1920	1980	1570	1680	1410	1020	1320	330	770	180	360	—	215	—	—
		E	480	360	320	320	240	320	100	350	20	100	10	30	—	10	—	—
E[a]	Hypalon	T	2175	660	740	470	720	460	670	470	400	440	200	380	270	170	400	—
		E	260	160	100	60	60	50	40	50	20	100	20	80	10	10	20	—
F[a]	NBR	T	2500	860	925	700	630	640	410	440	300	230	130	160	160	100	—	—
		E	300	140	170	120	80	100	80	70	20	40	20	20	10	10	—	—
G[a]	Acrylon EA-5	T	1875	1250	1260	1040	870	820	770	660	560	580	470	390	300	340	90	—
		E	480	290	200	230	140	200	100	170	80	160	60	130	20	110	20	—
H[a]	Hycar 4021	T	1825	1330	1090	940	840	630	610	610	580	495	330	460	370	370	50	290
		E	370	240	180	200	120	160	100	150	80	100	20	100	20	60	20	20
I[b, c]	Fluoro-Rubber 1F4	T	1200	450	475	345	360	225	265	210	215	225	140	165	135	—	—	—
		E	160	90	90	60	70	60	60	50	10	50	40	50	50	—	—	—
J[a]	Vyram N-5400	T	1300	700	610	590	580	470	430	315	450	225	—	180	—	—	—	—
		E	240	130	80	120	100	100	30	60	10	20	—	10	—	—	—	—
K[a]	Thiokol ST	T	1350	800	740	690	580	550	200	210	—	30	—	—	—	—	—	—
		E	240	180	140	140	120	120	60	110	—	50	—	—	—	—	—	—
L-1[a]	Polyurethane	T	5775	3220	3450	2320	2110	1260	1340	1090	580	750	100	—	—	—	—	—
		E	420	310	310	300	280	190	250	180	300	160	160	—	—	—	—	—
L-2[b]	Polyurethane	T	4240	1570	1550	1320	1180	810	800	690	530	515	240	380	65	—	—	—
		E	360	240	210	210	200	140	140	110	140	110	130	200	110	—	—	—
L-3[b]	Adiprene C	T	4650	1130	770	580	470	260	290	270	30	60	—	—	—	—	—	—
		E	480	220	120	140	70	60	80	80	70	160	—	—	—	—	—	—
M-1[b, d]	Silastic 916 U	T	1650	960	870	—	—	720	660	—	—	430	410	390	390	350	290	310
		E	580	390	390	—	—	330	340	—	—	240	220	200	180	190	160	180
M-2[b, d]	Silastic 50	T	1000	830	760	—	—	500	560	—	—	480	420	280	340	330	270	270
		E	300	190	200	—	—	130	130	—	—	110	110	70	80	80	60	70
N[b, e]	Viton A	T	1625	440	420	—	—	260	—	—	—	180	200	180	200	150	110	90
		E	230	150	140	—	—	100	—	—	—	70	80	80	70	70	50	60
O-1[b, f]	Kel-F 3700	T	2650	710	900	—	—	500	—	—	—	420	280	250	500	410	300	440
		E	300	130	120	—	—	100	—	—	—	90	70	50	110	80	90	90
O-2[b, f]	Kel-F 5500	T	1775	340	370	300	190	230	220	—	—	165	160	—	—	150	155	—
		E	390	400	380	320	310	230	220	—	—	190	160	—	—	160	190	—

[a]Preheat period of 30 minutes used for bringing test strips to test temperature.
[b]Preheat period of 6 minutes used for bringing test strips to test temperature.
[c]Post-cure: 24 hrs. @ 300° F.
[d]Post-cure: 1 hr. @ 300° F.; 8 hours @ 480° F.
[e]Post-cure: 1 hr. @ 300° F.; 1 hr. @ 350° F.; 8 hrs. @ 400° F.
[f]Post-cure: 16 hrs. @ 300° F.

sidered. The stress-strain properties of the most heat-resistant butyl compound, C-1 (phenol dialcohol cure), are shown in Figure 3. Of importance is the low degree of slope of both tensile strength and ultimate elongation curves as the test temperature was increased. In contrast to this is the steeper slope of the tensile strength curves of C-2 (accelerated sulfur cure) and C-3 (sulfur plus quinone) in Figures 4 and 5, respectively. The difference in ultimate elongation curves should also be noted. Butyl rubber cured with sulfur and accelerators increases in elongation as the temperature rises above 300° F. (Figure 4); while butyl

TABLE 4. SHORE A HARDNESS MEASURED AFTER HEATING ONE HOUR AND EIGHT HOURS AT VARIOUS TEMPERATURES

(Test blocks were allowed to rest 12 hours or more at RT after preheating or aging period before Shore A was measured.)

Preheated 1 hr. @ °F.:		—	200	—	300	—	400	—	500	—
Aged 8 hrs. @ °F.:		—	—	200	—	300	—	400	—	500
Compound	Elastomer	Shore A Hardness								
A	*Hevea*	68	69	70	68	67	59	72	—	—
B	SBR (FR-S 1500)	65	66	67	68	68	67	66	66	66
C-1	Butyl rubber	66	65	65	65	70	70	70	72	—
C-2	Butyl rubber	55	52	55	55	52	43	20	—	—
C-3	Butyl rubber	57	53	55	56	62	41	35	—	—
D	Neoprene	68	70	70	72	74	73	83	90	90
E	Hypalon	74	74	74	75	75	76	87	74	—
F	NBR	70	69	72	72	80	75	79	78	84
G	Acrylon EA-5	76	75	78	75	—	77	80	81	86
H	Hycar 4021	74	72	77	74	77	75	80	82	96
I	Fluoro-Rubber 1F4[a]	67	60	60	60	60	60	60	60	55
J	Vyram N-5400	68	70	70	71	78	[d]	[d]	[d]	[d]
K	Thiokol ST	67	69	64	68	66	—	—	—	—
L-1	Polyurethane	65	65	66	67	66	62	—	—	—
L-2	Polyurethane	62	62	63	64	63	56	•	•	•
L-3	Adiprene C	67	66	68	66	58	•	•	•	•
M-1	Silastic 916 U[b]	52	52	53	52	52	52	54	52	54
M-2	Silastic 50[b]	51	51	50	50	50	50	52	48	51
N	Viton A[c]	72	70	69	67	65	62	64	68	70

[a]Post-cure: 24 hrs. @ 300° F.
[b]Post-cure: 4 hrs. @ 300° F.; 8 hrs. @ 350° F.; 8 hrs. @ 400° F., 8 hrs. @ 450° F.; 4 hrs. @ 480° F.
[b]Post-cure: 4 hrs. @ 300°F.; 8 hrs. @ 350° F.; 8 hrs. @ 400° F.;
[d]Too brittle.
[c]Melted.

rubber with phenol dialcohol or quinoid-type cures (Figures 3 and 5, respectively) decreases in elongation with increasing temperature. All three butyl compounds resisted aging fairly well, as evidenced by the closeness of the circles and diamonds at any test temperature.

Copolymers of ethylacrylate with acrylonitrile (Acrylon EA-5) and 2-chloroethylvinyl ether (Hycar 4021) had higher tensile strength and ultimate elongation than did two other acrylates, a homopolymer of 2-cyanoethoxyethyl acrylate (Vyram) and poly (1,1-dihydroperfluorobutylacrylate) (Fluoro-Rubber 1F4). The rate of loss in tensile strength of all the acrylates was fairly low and comparable to that of butyl rubber.

Acrylates embrittled at relatively low aging temperatures, as shown in Figures 9 and 10. Figure 9 shows that aging had very little effect on loss of tensile strength of Acrylon EA-5 as the test temperature was increased, but had a decided effect on loss of ultimate elongation. Figure 10 shows very low tensile properties above 200° F. for Fluoro-Rubber 1F4, with no change due to aging.

For polyurethanes, aging at the test temperature did not contribute greatly to the loss in either tensile strength or elongation below 350° F. At 350 and 400° F., loss of tensile strength was severe. Polyurethane L-1 lost tensile strength rapidly from the 5775 psi. value at room temperature as the testing temperature rose to 300° F. (Figure 11). Ultimate elongation was retained at a respectable level up to 400° F.

A more heat-stable version of polyurethane was made by substituting butanediol and pentanediol for mixed ethylene and propylene glycols in ester preparation. In Figure 12 it should be noted that, although the room-temperature tensile strength of L-2 was not so high as that of L-1, above 200° F. the loss of tensile strength was less rapid. Compound L-2 had less ultimate elongation at room temperature than did L-1; however, retention of elongation was comparable percentage-wise. Both L-1 and L-2 were saturated polyester polyurethanes.

Adiprene C (L-3) is a polyether polyurethane with some unsaturation which permits curing with sulfur and accelerator. Stress-strain data for Adiprene C indicate a rapid decrease in tensile strength and elongation at test temperatures as low as 200° F. (Figure 13). Aged elongation varied little between 200 and 350° F., indicating a balance between chain scission and cross-linking. The upward turn of the unaged elongation curve indicates a predominate chain scission reaction at 400° F. Test strips of Adiprene C began to melt and degrade at this temperature.

The silicone rubbers are well known for their excellent aging. Aged and unaged stress-strain values are practically identical for one of the so-called "higher strength" silicone rubbers (Silastic 916) at any test temperature through 550° F. (Figure 14). Ultimate elongation remained comparatively high at that temperature. In comparison, a general-purpose silicone rubber (Silastic 50) shows the greatest differences to

TABLE 5. CRESCENT TEAR STRENGTH OF ELASTOMER COMPOUNDS AT ELEVATED TEMPERATURES

Test temp., °F.		73	200	300	400	500
Compound	Elastomer	Crescent Tear, Lbs./In.				
A	*Hevea*	864	362	311	204	[e]
B	SBR (FR-S 1500)	304	192	114	59	19
C-1	Butyl rubber	332	195	165	72	35
C-2	Butyl rubber	234	163	137	91	—
C-3	Butyl rubber (dioxime)	166	100	70	25	—
D	Neoprene Type GRT	696	323	218	101	13
E	Hypalon	256	56	36	19	16
F	NBR	228	98	63	49	18
G	Acrylon EA-5	216	109	58	60	26
H	Hycar 4021	226	117	65	37	18
I	Fluoro-Rubber 1F4[a]	118	34	16	11	6
J	Vyram N-5400	194	70	40	14	—
K	Thiokol ST	218	182	148	12	—
L-1	Polyurethane	308	155	101	92	[e]
L-2	Polyurethane	214	79	45	32	—
L-3	Adiprene C	211	68	33	20	—
M-1	Silastic 916 U[b]	187	83	54	42	—
M-2	Silastic 50[b]	68	39	32	18	—
N	Viton A[c]	179	62	23	4	—
O-1	Kel-F 3700[d]	134	69	38	24	—

[a]Post-cure: 24 hrs. @ 300° F.
[b]Post-cure: 1 hr. @ 300° F.; 8 hrs. @ 480° F.
[c]Post-cure: 1 hr. @ 300° F.; 1 hr. @ 350° F.; 8 hrs. @ 400° F.
[d]Post-cure: 16 hrs. @ 300° F.
[e]Melted.

be in lower room-temperature tensile strength and the lower ultimate elongation at all test temperatures (Figure 15).

Elevated Temperature Aging and Shore A Hardness

No attempt was made to measure the hardness of compound at elevated temperatures; instead, the measurement was made after preheating (one hour) or aging (eight hours) at the various elevated temperatures. The SBR and silicone rubber compounds maintained the most constant hardness over the widest temperature range (Table 4). Most compounds finally increase in hardness owing to continued cross-linking or oxidation as the aging temperature is increased; however, some butyl rubber compounds (C-2 and C-3) and the polyurethanes get softer as the polymer degrades with increasing temperature. The only compounds having a change of more than five points in hardness after aging eight hours at 300° F. were neoprene, NBR, Fluoro-Rubber 1F4, and Vyram N-5400.

Crescent Tear Strength and Temperature

Maximum tear strength of rubber compounds would be an important consideration in the tread of aircraft tires during landing or braking or pivoting while making a turn. Tear strength was measured at temperatures up to 500° F. in this experiment.

Hevea and neoprene compounds had the highest tear resistance at most temperatures (Table 5) and were the only elastomers having 100 lbs. in. tear resistance at 400° F. The quinone-sulfur cure of butyl rubber (C-3) resulted in much lower tear resistance than either the sulfur-accelerators (C-2) or the phenol dialcohol cure (C-1), which was best for tear resistance. Of the acrylates tested, Acrylon EA-5 had the highest tear resistance at 400° F.; while Fluoro-Rubber 1F4 had much lower tear resistance than the others. Of the polyurethanes tested, the one based on glycols having shorter chain lengths (L-1) had better tear resistance than the one based on longer chain length glycols (L-2). Adiprene C exhibited slightly less tear strength than L-2.

The tear resistance of the "high strength" silicone rubber was approximately twice that of the general-purpose type over the 73 to 400° F. temperature range.

The fluorocarbon polymers, Viton A and Kel-F 3700, had relatively low tear strengths, with the latter being better at 200° F. and above, and the former being best at room temperature.

Bibliography

(1) *Rev. gén. caoutchouc*, 32, 806 (1955).
(2) *India Rubber J.*, 117, 460 (1949).
(3) India RUBBER WORLD, 121, 299 (1949).
(4) H. A. Braendle, E. Valden, W. B. Wiegand, *Ibid.*, 110, 645 (1944).
(5) *Kautschuk u. Gumni*, 8, WT59-WT63 (Mar., 1955).
(6) A. J. DeFrancesco, "Testing of Silicone Rubber at Elevated Temperatures." Wright Air Development Center Technical Report No. 55-351 (Aug., 1955).
(7) A. J. DeFrancesco, R. D. Alling, J. H. Baldrige, "Compounding of Silicone Rubber—IV. Testing of Silicone Rubber at Elevated Temperatures." RUBBER WORLD, 134, 869 (1956).
(8) *Ind. Eng. Chem.*, 39, 1372 (1947).
(9) *Rubber Age (N. Y.)*, 79, 445 (1956).
(10) P. O. Tawney, J. R. Little, United States patent No. 2,701,895, to United States Rubber Co. (Feb. 15, 1955).
(11) W. J. Mueller, L. E. Novy, R. A. Clark, R. G. Heiligmann, "Development of High-Temperature, Oil-Resistant Rubber." Wright Air Development Center Technical Report No. 54-190, Part 3 (Dec., 1955).
(12) T. F. Lavery, F. S. Grover, S. Smith, L. J. Kitchen, *Rubber Age (N. Y.)*, 80, 843 (1957).
(13) J. H. Dillon, I. B. Prettyman, G. L. Hall, *J. Applied Phys.*, 15, 320 (1944).
(14) F. M. Smith, T. F. Lavery, R. A. Hayes, J. L. Kitchen, S. Smith, "Development of High-Temperature Resistant Rubber Compounds." Wright Air Development Center Technical Report No. 56-311, p. 30 (Dec., 1956).

(To be concluded)

Cellular Hypalon

Rubatex Products, Inc., New York, N. Y., reports interest on the part of some of its licensees in developing applications of cellular Hypalon[1]. The resistance to oxidation, ozone, sunlight, weathering, and chemicals characteristic of this material indicates that many uses of interest might be made of the cellular version. The major problem existing in the processing of Hypalon for cellular use is that of dispersion. Poor dispersion causes the formation of holes and soft spots in the expanded sheet.

The usual compounding principles may be applied in this application, but the softening of the polymer during mastication and milling must be kept to a minimum by the use of comparatively low temperatures in order to get good dispersion.

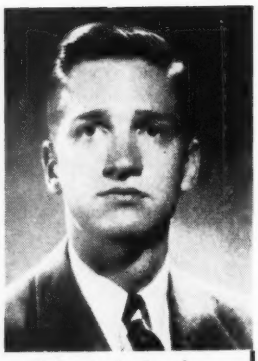
[1] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Vinyl Foam[1]

By CALVIN S. YORAN
Brown Rubber Co., Lafayette, Ind.

and ROBERT J. STOCKMAN
Union Carbide Plastics Co. Division, Union Carbide Corp., New York, N. Y.

Calvin S. Yoran



Robert J. Stockman

The Authors

Calvin S. Yoran, since September 1, 1958, technical director, Dryden Rubber Division, Sheller Mfg. Corp., Keokuk, Iowa, received his B.S. and Ph.D. degrees in chemistry from the University of Chicago, in 1930 and 1933, respectively.

Mr. Yoran has had very extensive experience in the sponge rubber field. His first position (1933-42) was chief chemist with the Featheredge Rubber Co., Chicago, Ill. Then, after a brief period as chief chemist with Witco Chemical Co., in its Chicago research laboratories, he joined Brown Rubber Co., Lafayette, Ind., in 1944 as research director. In 1946 he was made a director of the company, and in 1953, Mr. Yoran was appointed vice president in charge of research and product development.

He is a member of the American Chemical Society and has held several offices in its Division of Rubber Chemistry as well as in the Chicago and Detroit Rubber groups. He also belongs to the American Institute of Chemists and the Society of Automotive Engineers. Mr. Yoran has been particularly active on American Society of Testing Materials Committee D-11 on Rubber, serving on several subcommittees on cellular rubber. He is, moreover, chairman of subsection IV-N (Cellular Rubber) of the Technical Committee on Automotive Rubber—Section IV.

Robert J. Stockman, development engineer, vinyl foam, Union Carbide Plastics Co., New York, N. Y., received his B.S. degree in chemical engineering from the University of Wisconsin in 1951.

Mr. Stockman has been with Union Carbide Plastics since his graduation and served in various capacities in product administration and quality control before having been moved into his present work as development engineer on vinyl foam.

He is a member of the ACS, the ASTM, the SAE, the Society of the Plastics Industry, and the American Society for Quality Control.

VINYL foam is one of the newer elastomeric foams which has reached commercial production during the past three or four years. The term, vinyl, is being commonly used in industry to denote polyvinyl chloride resin, and the open-celled cellular products are called vinyl foam. Polyvinyl chloride is a thermoplastic resin which is a rigid plastic, but, by the addition of proper plasticizers, can be made flexible and soft as rubber compounds. It has good tensile and tear properties and is very resistant to attack of ozone, light, oils, and most chemicals.

Plasticized vinyl may be milled, calendered, extruded, and molded on conventional rubber or plastic machinery, and by the incorporation of blowing agents it is possible to make a cellular vinyl article of either open or closed structure (interconnecting cells or non-connected). Very little sponge or expanded vinyl has been made by this process, probably because of manufacturing difficulties, cost, and limited properties possible.

Since the war another process, plastisol compounding technique, has made it possible to fabricate vinyl articles from liquid pastes and avoid the use of heavy milling and mixing equipment usually associated with the rubber and plastic industries. Plastisols are an outgrowth of a discovery of Waldo Semon[2] in 1927 that vinyl resins would dissolve in high boiling solvents when heated to elevated temperatures, and, when cooled, a rubber-like mass resulted which had exceptionally good physical and chemical properties. During the past ten years the actual plastisol technique has been developed and perfected for many types of products.

A plastisol is a paste resulting from mixing a specially prepared resin in finely divided form into one or more liquid plasticizers, such as tricresyl phosphate or dioctyl phthalate. The plasticizers should have enough solvating action on the resin particles to hold them in suspension at room temperatures and be capable of dissolving them completely at elevated temperatures such as 340° F.

This solution of the resin and plasticizers into one another is commonly called the fusion, and unless this fusion is complete, very poor physical properties will result. The fusion of a plastisol takes place without an exothermic reaction, without evaporation of a solvent or volatiles, and without the necessity of pressure, which is so often necessary in other plastics to attain good physical properties.

[1]Presented before the Division of Paint, Plastics & Printing Ink Chemistry, Chicago, Ill., Sept. 9, 1958.
[2]United States patent No. 1,929,453 (B. F. Goodrich Co.).

Vinyl Foam

Vinyl foam is one of the newer elastomeric foams which may be manufactured from polyvinyl chloride resin by means of plastisol techniques. While cellular vinyl products may be made in both open and closed-cell types using chemical blowing agents, vinyl foam which has been produced by the expansion of a gas previously dissolved in the plastisol under high pressure is discussed in this paper.

The compounding, processing, and manufacture of vinyl foam are reviewed, and data presented on the effect of plasticizer concentration on the load deflection properties of the foam as well as on the effect of coring on a seat cushion pad.

Test results for typical vinyl foams are given for properties whose test methods have been developed by committees of the Cellular Plastics Division of the Society of the Plastics Industry. These test methods include indentation load deflection; compression deflection; air oven aging; compression set under constant deflection; dynamic flexing and density.

In addition to the properties enumerated above, several other properties of interest in cushioning applications have been studied. These properties include fire resistance; tensile strength; static charge; compression set at high deflection; humid aging and dynamic cushioning characteristics.

(This paper is the second in a series begun with the paper entitled, "Present Status of Latex Rubber Foam," in our November, 1958, issue and will be followed with a paper on urethane foam in February, 1959. The purpose of this series is to review the current available knowledge and status of these three major elastomeric foams. EDITOR.)

This last fact also makes it possible to make vinyl foam from a plastisol, and plastisols have made it possible to make vinyl into cellular or foam products which were not possible by ordinary methods. Both closed-cell vinyl and open-celled foam are being made by using the plastisol method. The closed-cell type is usually made in a two-stage, patented[3] process using chemical blowing agents, and this method closely parallels the method of making closed cellular rubber parts.

Manufacture of Vinyl Foam

Vinyl foam, made from a plastisol, may be made in two ways. One method is similar to chemically blown sponge rubber in that a blowing agent, which decomposes to yield a gas when heated, is used to form the cellular structure. The second method is more of a parallel to the manufacture of foamed latex in that a foam is produced mechanically by dissolving an inert gas, carbon dioxide, under pressure and then releasing the pressure, causing the dissolved gas to come out of solution forming bubbles which form the foam. This latter process is covered by U. S. patent No. 2,666,036 issued to the Elastomer Chemical Co., Division of Union Carbide Corp.

ATMOSPHERICALLY BLOWN SPONGE
Starting Point Formula

Polyvinyl chloride resin[a]	100
Polymeric plasticizer (high viscosity)	50
(medium viscosity)	50
Lead stabilizer	3
BL-353[b]	10
Sponge density lbs./cu. ft.	7
% Expansion	1,100%

[a]Geon 121, B. F. Goodrich Chemical Co., Cleveland, O.
[b]See footnote [6].

In a vinyl formulation, the principal components are the resin itself, the plasticizer, or, as we say, plasticizer system stabilizers and, possibly, fillers and colors. Blowing agents are also necessary in the chemically blown type and materials may be added to improve the fire resistance if this property is important in the application. The so-called paste resins which are made especially for plastisol compounding are available from several of the resin producers.

The selection of plasticizers is one of the most important factors in compounding a vinyl foam both from processing point of view and the properties of the final product. This subject is so complex that time would not permit its coverage in a paper such as this. Usually a combination of two or three plasticizers are used to obtain the best results. Ester-type plasticizers such as tricresyl phosphate (TCP) and dioctyl phthalate (DOP) are widely used as well as polymeric types which polymerize during fusion. Stabilizers are extremely important in vinyl foam, even more than in other types of plastisol manufacture because longer fusion times are required to fuse large molded items when fused in an oven since the foam is such a poor heat conductor.

Stabilizers are needed for vinyl because when vinyl is heated to high temperatures for any extended time or exposed to light, it tends to decompose by the loss of hydrochloric acid, HCL, from adjacent carbon atoms in the molecule. Once started, this splitting off apparently continues along the chain and produces conjugated systems; the foam darkens in color and becomes hard and brittle. Stabilizers capable of absorbing and neutralizing any HCL split off this way prevents this progressive reaction. Stabilizers are usually compounds containing lead, tin, barium, cadmium, or zinc. Lead stabilizers in addition to toxicity have the disadvantage of turning black when exposed to high concentrations

[3]U. S. patents Nos. 2,283,316; 2,229,593; 2,291,213 (Rubatex Products, Inc.).

of hydrogen sulfide often encountered in industrial areas.

Chemical blowing agents being used in vinyl foam production include Unicel ND[4] (dinitrosopenta-methylene-tetramine), Cellogen OT[5] p,p' oxy bis (benzene sulfonyl hydrazide), BL-353[5] (N,N'-dimethyl-N,N'-dinitroso terephthalamide) and Porophor N (azoisobutyric nitrile). The last material has been largely discontinued in this country because of toxicity of fumes during heating.

Plastisol can be made by quite simple mixing where resin and plasticizer are stirred together. On a laboratory scale a laboratory-size Hobart mixer or pony mixer may be used. For production, larger internal mixers are usually used. It is advisable to disperse colors or stabilizers on an ink mill before adding to the regular plastisol mix. In the case of chemically blown plastisol foam, the mixed plastisol is ready for molding and is either metered or weighed out for a mold charge.

In mechanical formation of a vinyl foam by the Elastomer Process, carbon dioxide gas is dissolved into the plastisol in a machine called a Votator.[6] A simple diagram, Figure 1, shows the essential parts of the continuous vinyl foam process. The mixed plastisol composition is placed in the feed tank from which it is pumped into the mixing chamber. The mixing chamber is a jacketed cylinder which is refrigerated to increase the solution of gas which is also introduced into the feed line just before it reaches the mixing chamber. The plastisol containing gas under pressure is discharged into a mold or on to a conveyor, or a belt if a sheet or slab is being formed.

This discharge may be merely a flow through a restricted pipe or, for lighter densities, it is usually sprayed out from small spray tips. The gas begins expanding immediately with the release of pressure, but with the heating of the mold the ultimate expansion of the foam takes place so that molds are not completely filled, and sufficient venting is necessary to allow for the elimination of air out of the way of the expanding foam to prevent air traps.

The fusion, which corresponds to the curing or vulcanizing of rubber, may be accomplished in an oven, or press or by any method of heating the mold to a temperature of about 350° F. In the case of slab or sheet vinyl foam, fusion may be accomplished very quickly in a dielectric field in a time of two or three minutes. Here the heat is generated within the mass of the foam uniformly and quickly and does not depend upon the transfer of heat through the foam itself. After the fusion is attained, the molds must be cooled down to at least 150° F. before parts may be removed; otherwise distortion of the part will result.

In addition to molding foam parts, an integral vinyl skin may be molded as a covering to a part, and metallic inserts may be molded into parts to serve as retainers for the part. If the mold surface has a texture such as

[4]E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
[5]Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
[6]The Girdler Co., Votator Division, New York, N. Y. This is a special mixing machine designated simply as "mixer" in Figure 1.

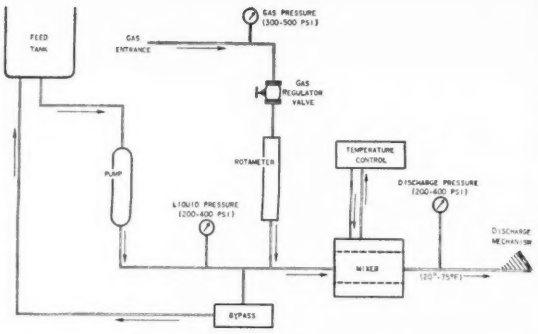


Fig. 1. Schematic diagram of the continuous vinyl foam process of the Elastomer Chemical Co. Division, Union Carbide Corp.

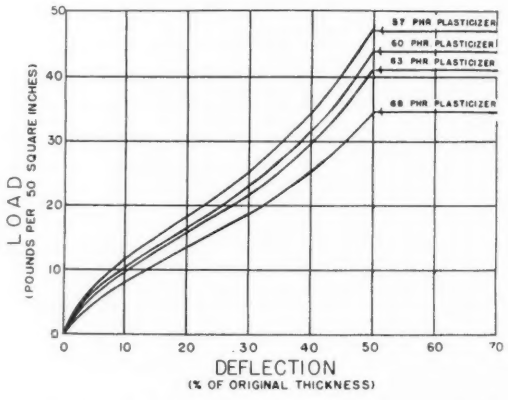


Fig. 2. Effect of plasticizer concentration on load-deflection characteristics of vinyl foam

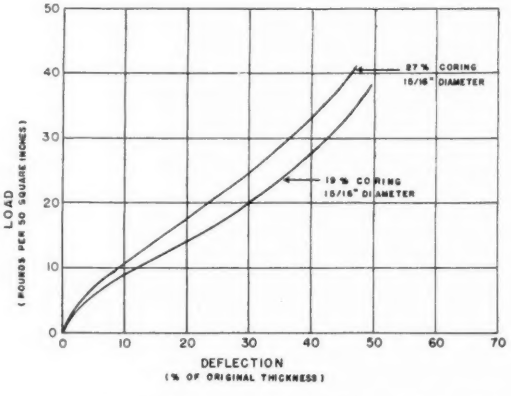


Fig. 3. Effect of core spacing on load-deflection characteristics of vinyl foam

a leather-like grain, the skin will give a perfect negative of this surface. This skin plastisol compound may be applied to surface of the mold by slushing, spraying, or rotational casting such as is used in making dolls and toys. After the skin has been applied to the surface of the mold, the mechanical foam or plastisol containing a blowing agent is placed into the mold cavity. In both cases it is necessary to provide a method of vent-

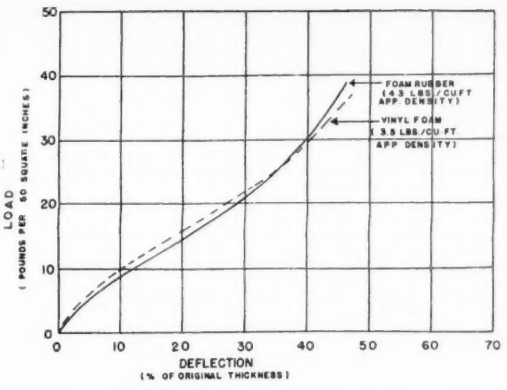


Fig. 4. Comparison of load-deflection characteristics of vinyl foam and foam rubber

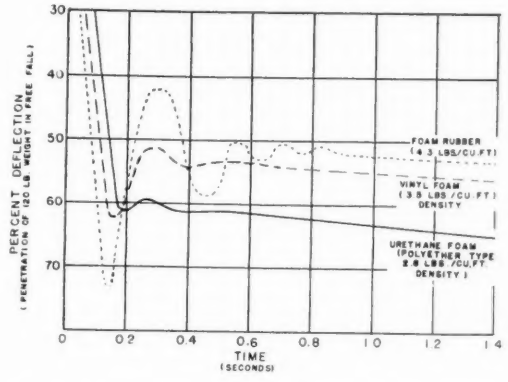


Fig. 5. Comparison of dynamic cushioning characteristics of molded vinyl, rubber, and urethane foams under constant load

ing air from the mold to allow foam completely to fill the cavity.

The formulations for the Elastomer Process are somewhat similar to chemically blown vinyl foam formulations except there is greater latitude in amount and type of plasticizers. A typical formulation, LC-41, follows:

LC-41	Parts
Polyvinyl chloride resin[a]	100
Santicizer 141[b]	25
Dioctyl adipate	25
phthalate	10
Drapex 3.2[c]	5
Organo barium-cadmiun complex-type stabilizer	3
Organo zinc complex-type stabilizer	1
Fatty acid alkanol amide-type surfactant	1
	170

[a]Bakelite QXKV, Union Carbide Plastics Co. Division Union Carbide Corp., New York, N. Y.
[b]Octyl diphenyl phosphate, Monsanto Chemical Co., rubber chemicals department, Akron, O.
[c]Octyl epoxy stearates, Argus Chemical Corp., Brooklyn 31, N. Y.

One of the advantages of the Elastomer Process lies in the possibility to control load-carrying capacity of a foam without a corresponding change in density of the foam. This point is illustrated in Figure 2, where foams of practically the same density can be made with higher load values by lowering the plasticizer content.

In molding seat cushions or any larger masses of vinyl foam in molds using heat conducted into the foam from the mold, it is necessary to have core pins which penetrate into the mass of the cushion and conduct heat into the interior of the cushion. The size of the core pins and spacing is not only important to provide heat for fusion, but also has an effect upon the load deflection curve of a seat cushion. Figure 3 represents the load deflection curves of two "Tee"-type seat cushions, five inches thick, where two different degrees of coring were explored. The load-carrying capacity of the cushion was increased by going from a 19% coring to a 27% coring.

Properties of Vinyl Foam

A vinyl foam seat cushion may be made which shows a load deflection curve falling very close to a similar cushion made in foam rubber. Figure 4 shows a comparison of a load deflection curve for vinyl foam and foam rubber in a five-inch-thick "Tee"-type seat cushion. The load values were taken on the third cycle after being compressed twice to a deflection of 50%, and deflection was at a rate of 0.5-inch per minute.

A study of vinyl foam, foam rubber, and urethane foam was made to compare the dynamic cushioning characteristics of these foams. Here a 120-pound weight was allowed to fall upon the cushion and the percent deflection was recorded against time. In Figure 5 it will be noted that the vinyl foam curve is intermediate between the foam rubber and urethane foam displaying less bounce or "fight back" than foam rubber, but not so "dead" as the urethane foam. This property can be varied somewhat, depending upon whether energy absorption is desired.

The Cellular Plastics Division of the Society of the Plastics Industry has had committees formulating test methods and specifications for both vinyl foam and urethane foam, and some typical values have been obtained for some of the properties whose test methods are defined in these new specifications.

INDENTATION LOAD DEFLECTION: Ranges of values similar to foam rubber grades have been adopted, and it is possible to formulate vinyl foam to most of these ranges.

COMPRESSION DEFLECTION: Ranges of values for firmer grades defined by specification can be matched by proper formulations and processing.

AIR OVEN AGING: The change in load deflection properties after aging in an air oven for 22 hours at 212° F. is limited to ±20%, and typical values measured ranged from a —7.9% to a +4%.

COMPRESSION SET UNDER CONSTANT DEFLECTION: This test requires compressing specimen to 50% of its height, holding for 22 hours at 158° F., removing clamps, and allowing recovery for two hours at 158° F. The limit specified is 15% maximum set, and actual test results range from 1.5 to 8.2%.

STATIC FATIGUE: Specimen is bent sharply back upon itself and held for 22 hours at 158° F. and should not show cracks. Vinyl foam properly formulated and manufactured will not show any cracks.

DYNAMIC FLEXING: In this test a cushion or slab is compressed to 50% of its free height at a rate of 60 cycles per minute. After 250,000 cycles, the set is measured after a two-hour recovery and should not exceed 10%. In tests of typical vinyl foams the set ranged between 2% and 3%.

In addition to the tests described in the SPI specifications, vinyl foam was subjected to some of the tests which have been incorporated in the urethane foam test methods prepared by SPI committees.

TENSILE STRENGTH: When, measured as defined in the urethane foam test method, a value of 32 pounds per square inch was obtained on a slab of commercial vinyl foam.

COMPRESSION SET UNDER CONSTANT DEFLECTION OF 90%: This test is the same as Compression Set at 50% except that deflection is increased to 90% and sample was allowed to recover for 24 hours at room temperature. Actual value on a cushion was 23.8%, but if a recovery of two hours at 158° F. was used, a set of only 8.4% was obtained.

HUMID AGING: For an accelerated aging test of urethane foam, an autoclave test has been developed in which specimen is heated in steam for three hours at 220° F. and effect on load deflection and on compression set is measured. Figures 6, 7, and 8 show the effect of humid aging on the load deflection curves of vinyl foam, foam rubber, and urethane foam, respectively.

The effect of humid aging on compression set of some actual parts may be summarized in the following table:

COMPRESSION SET

	Original	After Humid Aging
Vinyl foam A	6.1%	7.0%
B	8.5%	7.9%
C	6.3%	6.7%
Foam rubber	8.1%	2.2%
Urethane foam A	2.3%	4.5%
B	3.4%	5.0%

FIRE RESISTANCE: While a test method for fire resistance has not been accepted, vinyl foam was tested by a proposed method incorporated in original versions of the specification and flame went out in from 4-10 seconds; while commercially available foam rubber and urethane foams tested burned until sample was consumed.

STATIC CHARGE: Specimens were compressed to 50% for 10 cycles and static charge measured. Vinyl foam showed a charge from 40 to 145 volts, but charge dissipated immediately. Foam rubber specimen in the same test developed a charge of 160-250 volts and retained 70 volts of static charge after 24 hours.

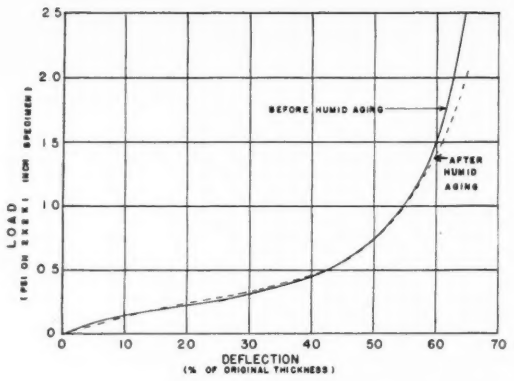


Fig. 6. Compression deflection of vinyl foam after humid aging

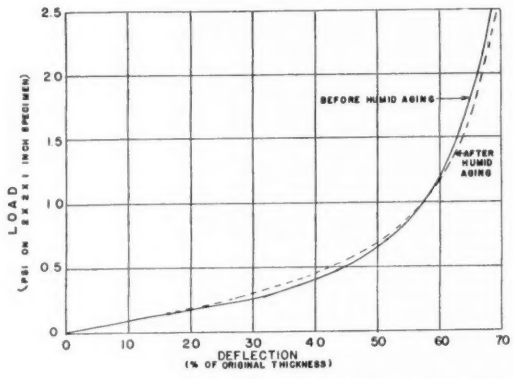


Fig. 7. Compression deflection of foam rubber after humid aging

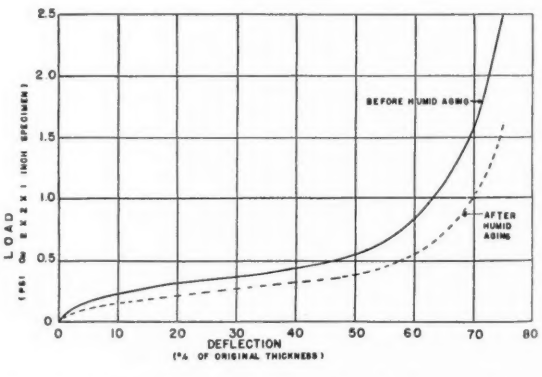


Fig. 8. Compression deflection of polyether urethane foam after humid aging

Bibliography

"Foamed Plastisols," E. H. Schwenke, *Bakelite Review*, Jan., 1954.

"Vinyl Foamed with Gas," *Modern Plastics*, Apr., 1954.

"Geon Resin 121 in Plastisol Compounding," Service Bulletin PR-3. B. F. Goodrich Chemical Co. (June, 1954).

"Vinyl Foam and Sponge," W. F. Lahey, American Management Association, Packaging Series, No. 46, pp. 109-113 (1955).

"Rubber and Plastic Foams," A Panel Discussion Held at Akron Rubber Group. *Rubber Age (N. Y.)*, May 1955, p. 247.

"Vinyl Foams Made by Atmospheric Pressure Method," *Plastic Tech.*, 2, 246 (1956).

"Elastomeric Cellular Materials," I and II. T. H. Rogers, RUBBER WORLD, Aug., 1955, p. 610; Sept., 1955, p. 753.

"Commercial Volume Grows for Elastomer Process Vinyl Foam," Good Chemco News, Aug., 1955.

(*Continued on page 549*)

Fundamental Control Concepts—II[1]

By MASON E. WESCOTT

University College, Rutgers University, New Brunswick, N. J.

THE following installment concludes the informative article on fundamental control concepts which was begun in our December issue.

The Concept of Scientific Acceptance Sampling

We shift our attention now from concepts bearing on the question, "What shall we do with the process: leave it alone or take corrective action?", and turn to a brief consideration of another fundamental question that has to be answered daily in industrial operations: "What shall we do with this lot of product that has been submitted for our acceptance—take it, reject it, or sort it?"

We can do one of three things: (1) accept the lot on faith without any inspection; (2) test every item in the lot (if the inspection test is non-destructive); (3) examine a sample from the lot and in some way use this sample information as a basis for deciding what to do with the lot. Procedure (1) is sometimes used, but it certainly could not be recommended as a general practice. Procedure (2)—the well-known 100% sorting operation—sometimes has to be done, but as a general practice it is certainly costly and in a great many cases actually gives less assurance than many people might believe. Procedure (3)—sampling inspection—has the attractive advantage of costing less if it can be done in such a way as to provide adequate protection.

Rule-of-thumb sampling plans, such as the common practice of taking a 10% sample from the lot, often miss the mark of providing adequate protection by surprisingly wide margins. Modern, scientific sampling plans are designed to give measurable degrees of protection so that when they are used it becomes possible to know just what risks are being run. And this is important, because it simply is not possible to guarantee a correct decision on a submitted lot by basing the decision on sample evidence—there is always the risk that the sample will misrepresent the lot, and thus the wrong decision on it will be made.

There are two parties involved in an acceptance sampling situation: the supplier and the user. We would like to have an acceptance inspection procedure that never rejected a good lot or never accepted a bad lot. Such a procedure would be completely fair to both parties. But this is impossible under *any* sampling inspection procedure. The supplier has to accept the possibility that under sampling inspection some of his good lots are going to be falsely rejected. The user has to accept the fact that under sampling inspection he is going to make the mistake of sometimes accepting bad lots. If no mistakes in judgment can be tolerated, sampling inspection simply cannot be used, because the inevitable fluctuations of sampling error will be as certain as sunrise to give some wrong answers.

So the problem is to find out for a proposed sampling procedure just what power the plan has to tell the difference between good lots and bad lots and just how much risks there are that the plan will make the mistakes of rejecting a good lot or of accepting a bad one.

We shall limit our discussion to a particular plan so that we can see just how some of these ideas apply in a specific case. Suppose the plan reads as follows: the lot size shall be in the range 501 to 800. For each such lot, take a random sample of 75 pieces from the lot and inspect each piece in accordance with written instructions specifying just how the inspection test shall be made so as to classify the piece as acceptable or not acceptable. Keep a record of the number of defective pieces found in the sample. If no more than six defectives have been found by the time all 75 have been inspected, accept the lot; otherwise reject it.

We cannot be concerned here with how this plan was derived, but we do propose to see just what the plan can be expected to do. In the first place, note that a *random* sample is required. To enlarge on this matter would involve a fairly lengthy discussion. Suffice to say that all modern sampling plans are based on the assumption that random samples will be taken for inspection. Practically, we have to take this to mean that the items to be inspected shall be taken without bias from as many segments of the lot as cost and handling considerations will permit. It just will not do to use the 75 most conveniently available pieces from the lot if we expect to get the protection promised by the design of the plan.

In the second place, note that the inspector is not required to estimate the quality of the lot. All he has to do is a good job of inspecting the pieces in the sample, rejecting the lot if he finds more than six defective pieces, and accepting it otherwise. It is possible for even a random sample from a good lot to have more than six defectives in it and thus to be falsely rejected. Likewise it is possible for even a random sample from a bad lot to have six or fewer defectives in it and thus to be falsely accepted.

Consider now the curve in Figure 5. It is called the "operating characteristic" or "OC" curve for the plan. The horizontal axis is scaled to represent various degrees of lot quality in per cent. defective that may be submitted to the plan for acceptance. The

[1]Presented before the American Society for Quality Control, Chemical Division, Buffalo, N. Y., Oct. 2, 1958.

vertical scale is a probability scale. It gives the probability that if a lot of specified per cent. defective quality is submitted, the plan will accept the lot. So with this curve before us we can see how the plan will react to all kinds of lot quality from very good to very bad.

To be specific, suppose we define a good lot as one that is 4% defective. This is called the "acceptable quality level" or AQL. The curve says that when such a lot is submitted, there is a 95% chance that the plan will accept it. What this means, of course, is that out of all lots which are 4% defective and which are properly inspected by this plan, we can expect about 95% of them to be accepted and 5% to be rejected. This 5% figure is the "producer's risk," because it measures the risk he has to run of having a good lot rejected by the plan.

At the other end of the scale, suppose we define a bad lot as one that is 13.6% defective. This is called the "lot tolerance per cent. defective" or LTPD. The curve says that when such a lot is submitted, there is a 10% chance that the plan will accept it. Thus, out of all lots that are 13.6% defective and which are submitted to this plan, we can expect about 10% of them to be accepted. This 10% figure is the "consumer's risk," because it measures the risk he has to run of having a bad lot accepted by the plan.

There is nothing sacred about the 4% AQL or the 13.6% LTPD used here—you can choose other values to define good and bad lots. The point is that whatever values you choose, the OC curve for this plan will tell you what you can expect the plan to do to these good and bad lots in the long run. Any AQL and LTPD you choose separates incoming lots into three classes, as shown in Figure 5. There is a high

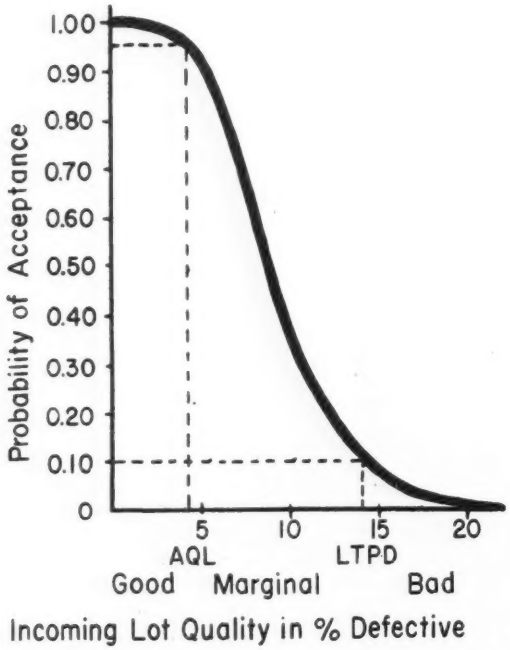


Fig. 5. Operating characteristic or "OC" curve for a given sampling plan

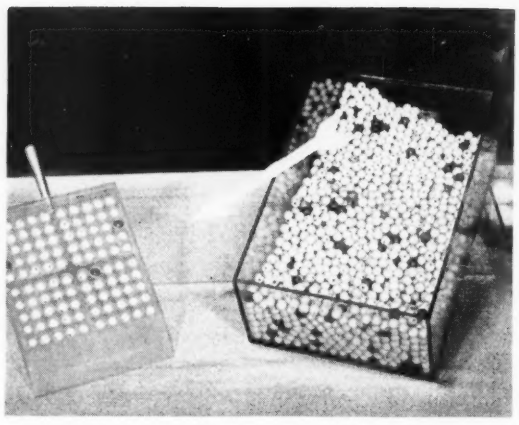


Fig. 6. Equipment for determining just how a proposed sampling plan can be expected to work, consisting of box of colored beads and scoop with holes in which these beads will fit easily

possibility of consistently accepting good lots, a low possibility of accepting bad lots, and decreasing likelihood of taking lots of marginal quality as the submitted lots in this zone get poorer in quality.

The plan we have been discussing is a single sampling plan. There are also double, multiple, and "sequential" plans available. Usually one can find among the battery of plans published in existing tables one or more that will meet a particular need.

Also, there exist batteries of scientific sampling plans that can be consulted for an appropriate plan when the inspection test involves the *measurement* of some characteristic rather than simply classifying items as good or bad. These are known as "variables sampling plans." Each such plan also has its own OC curve, and all we have said here about the basic concepts of acceptance sampling by attributes applies with equal force to the case of acceptance sampling by variables.

The subject of acceptance sampling is a very broad one; all we have tried to do here is to emphasize the basic fact that adequate protection can be had economically through the use of a scientific sampling plan despite the fact that sampling always involves risks. The theme song for successful acceptance sampling might well be, "Know what risks you can tolerate and seek a sampling plan that will control these risks at costs you can afford." There can always be found (or designed) a plan that will fit any reasonable requirements, and, what is more, with a properly designed plan you will not be playing blindman's buff with quality protection—you will be able to predict very closely just how the plan will operate for you if it is properly administered.

One very instructive way to find out by simple experiment just how a proposed sampling plan can be expected to work is to get a box of white and colored beads and a scoop with holes that these beads will fit easily. Let the white beads represent good pieces and the colored beads defective pieces, and make up mixtures with varying degrees of defectiveness.

For example, one might use 1032 white beads, 24 blue beads, 48 yellow beads, and 96 red beads—a total of 1200 beads in the box. With such a mixture, one can experiment with lots that are 2%, 4%, 6%, 8%, 10%, 12%, and 14% defective. A scoop with 100 holes in it will provide for a wide variety of sample sizes. For a given sampling plan one can then "inspect" quite rapidly a large number of possible situations and thus verify experimentally that the laws of probability built into modern sampling plans really do work. Figure 6 shows equipment of this sort for which a sample of 100 that is 3% defective has been drawn.

The Concept of Defect Prevention

The driving philosophy behind all the techniques of SQC is that of defect prevention. Defective work can never be completely eliminated, but costly scrap and rework losses can be *prevented* by wise use of these techniques. It is always cheaper to make the product right in the first place rather than trying to sort it out afterward. This is the target toward which every technique in SQC is aimed, and the real objective of "control" in its soundest sense.

A good, sound, successful SQC program never comes into being over night. It thrives better by gradual growth from a small beginning. In the final analysis real quality control—with or without SQC—is a matter of attitude involving everyone in the plant from the humblest operator to top management. It must be understood by everyone that SQC is essentially a "get smart" policy, not a "get tough" policy. But it is always aimed at preventing defective work, and it succeeds best in an atmosphere in which there is an integrated effort to nurture an attitude of quality mindedness.

We believe that the techniques of SQC can help very effectively in creating a genuine interest in defect prevention because it gives everyone concerned the kind of information that is needed to accomplish this objective. It probably would be difficult to arouse much interest in the game of golf if there were no way to keep score. In the same way, developing an attitude of real quality mindedness aimed at the target of defect prevention has a far better chance when the tools used in this effort make it possible to keep score. The difference between quality control in general and SQC in particular is that the latter makes possible a realistic attitude toward quality/cost problems and provides a systematic quality accounting procedure for measuring progress.

At least the testimony of increasing numbers of industrial plants that have found these methods helpful is to the effect that a quality control program that makes *statistical* quality control a vital part of the total effort gets at least three very worthwhile results: (1) better quality of conformance to design; (2) lower overall operating costs; and (3) greater volume of good production.

Bibliography

(1) "Statistical Quality Control," E. L. Grant. McGraw-Hill, New York (1952).
(2) "Quality Control Handbook," J. M. Juran. McGraw-Hill (1951).
(3) "Quality Control Principles, Practice, and Administration," A. V. Feigenbaum. McGraw-Hill (1951).
(4) "Sampling Inspection Tables," H. F. Dodge and Harry E. Romig. John Wiley & Sons, Inc., New York (1945).
(5) "Military Standard 105A—Sampling Procedures and Tables for Inspection by Attributes," Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. (1950).
(6) "Manual on Sampling Inspection by Mil-Std-105A." American Society for Quality Control, New York (1953).
(7) "Sequential Analysis of Statistical Data." Columbia University Press, New York (1945).
(8) "Military Standard 414—Sampling Procedures and Tables for Inspection by Variables for Per Cent. Defective." Superintendent of Documents. U. S. Government Printing Office, Washington 25, D. C. (1957).
(9) "Practical Chemical Process Control," R. S. Bingham, Jr. *Ind. Quality Control*, XIII, 11, May, 1957, p. 46.
(10) "Control Charts in Multi-Stage Batch Processes," R. S. Bingham, Jr. *Ibid.*, XIII, 12, June, 1957, p. 21.

Vinyl Foam

(Continued from page 546)

"Flexible Foams—Present and Future," J. A. Carr and B. B. Williams, *Modern Plastics*, Sept., 1955.
"Plastic Foams for Furniture Cushioning," *Upholstering*, Nov., 1955, p. 92.
"Vinyl Foam," Henry Allen, *Plastics Tech.*, 2, 306 (1956).
"Foam Plastics," Walter Brenner, *Materials & Methods*, June, 1956, p. 144.
"Plastic Foams—Their Relationship and Competitive Picture," J. J. Hirsh, *Plastics Tech.*, 2, 377 (1956).
"Designing with Vinyl Foam," R. Wistozky, *Ibid.*, 2, 443 (1956).
"Tentative Specifications and Methods of Test for Flexible Foams Made from Polymers or Copolymers of Vinyl Chloride," The Society of the Plastics Industry, New York 17, N. Y. (April 1, 1958).
"Tentative Methods of Test for Flexible Urethane Foam." SPI (March 31, 1958).

New Radiation Meter

Applied Radiation Corp., Walnut Creek, Calif., has announced a new use for the ARCO model AE1-101 current integrating electrometer. When combined with proper external circuitry, this instrument may be applied to industrial measurement control and instrumentation systems. It may be applied wherever the changing quantities can be transduced into an electric current.

Variations in light; flow, velocity, or ion exchange in chemical processes; electroplating; or titrating are some of the applications which can be measured. The use of this meter, initially designed for particle accelerator beam current integration, gives the physicist, chemist, engineer, or other researcher a new tool to assist in solving problems where it is necessary to know with every great accuracy the total number of electrons or positive ions associated with a process or reaction.

The meter is reported to be useful in applications that were extremely difficult to monitor. An example is the measurement of total dosage delivered to a sample by an electron linear accelerator or other source of high energy particles.

NEWS of the RUBBER WORLD

House Ways and Means Committee will continue its consideration of possible changes in taxation policy on American companies' foreign investments, in the 86th Congress. Rubber industry's reluctance to attend hearings on this subject could be to its disadvantage. The Administration is, at the same time, attempting to negotiate preferential tax treatment for American companies investing funds abroad.

Year-end statements by government, the Rubber Manufacturers Association, and industry leaders continue optimistic regarding the outlook for business in the rubber industry in 1959. Tire shipments for 1959 are estimated at 113 million units; non-tire product manufacturers expect improved sales; and estimated new rubber consumption at 1.5 million tons may equal or exceed the 1955 record.

Natural Rubber Bureau estimates that world natural rubber consumption at 1,950,000 tons in 1959 will exceed production by 30,000 tons and that natural consumption in the United States will be 10% greater in 1959 than in 1958. The RMA has estimated that synthetic rubber consumption in the U. S. in 1959 will amount to 975,000 as compared with 854,000 tons in 1958.

RMA registers vigorous protest to proposed tax increases to finance expanded federal highway construction program. Suggests appropriation from General Fund instead.

National Science Foundation has announced the establishment of a Science Information Service to make science literature of all languages readily available to scientists and engineers. Commerce Department and the National Academy of Sciences jointly announced new steps to gear scientific programs of the Commerce Department "to the rapidly changing needs of science and industry."

P. W. Litchfield, honorary chairman, Goodyear Tire & Rubber Co., was honored for his many contributions to his community, the rubber industry, and to the world at a testimonial dinner in Akron on December 15.

MEETINGS and REPORTS

Business Operations and Testing Symposia of Southern Group—I

The Southern Rubber Group held its fall meeting in New Orleans, La., on October 17 and 18, at the Roosevelt Hotel. Two technical sessions were held at the two-day meeting. On Friday afternoon a discussion on "Business Operations of the Rubber Industry" was featured, and on Saturday morning the session dealt with several aspects of "Physical Testing". A banquet with a talk by Garvin Drew, A. Schrader's Son, Brooklyn, N. Y., on "South America and the Rubber Industry," highlighted the Friday evening portion of the meeting.

The technical session held on Friday afternoon on "Business Operations of the Rubber Industry" was moderated by Charles D. York, B. F. Goodrich Co., Tuscaloosa, Ala. The panelists for this session were Tom Brown, Goodrich, Tuscaloosa; Balmer Hill, Armstrong Tire & Rubber Co., Natchez, Miss.; G. J. Sortet, Firestone Tire & Rubber Co., Memphis, Tenn.; and J. Long, Goodyear Tire & Rubber Co., Gadsen, Ala. (see page 552).

The Saturday morning session concerning the physical testing of rubber tires and other products was lead by P. W. Libby, J. M. Huber Corp., Borger Tex., as moderator. The panel members for this session were (see February issue) N. C. Penfold, Automotive Research Associates, San Antonio, Tex.; M. F. Torrence, E. I. du Pont de Nemours & Co., Inc. Akron, O.; R. G. Dunlop, Smithers Laboratories, Akron; and B. W. Habeck, Goodyear Tire & Rubber Co., Akron.

New Officers

Officers of the Group for 1958-1959 are: Warren Hall, chairman, Phillips Chemical Co., Akron, O.; vice chairman, Eldon H. Ruch, Firestone Tire & Rubber Co., Memphis, Tenn.; treasurer, Rosewell C. Whitmore, Better Monkey Grip Co., Dallas, Tex.; secretary, Edward J. Strube, E. I. du Pont de Nemours & Co., Inc., Atlanta, Ga.; directors (one year), T. R. Brown, B. F. Goodrich Co., Tuscaloosa, Ala., Albert Koper, Harwick Standard Chemical Co., Albertville, Ala., and Robert D. Baker, General Tire & Rubber Co., Waco, Tex.; directors (two years) G. H. Boeder, Goodrich, Tuscaloosa, and Lenoir Black, C. P. Hall Co., Natchez, Miss. Committee chairmen for the year are: membership, Charles M. White, Cabot Carbon Co., Dallas, Tex.; publicity, D. A. Reneau, United Carbon Co., Memphis; and education, James P. McKenzie, Copolymer Rubber & Chemical Co., Baton Rouge, La.

T. R. Brown *(left)*, presenting Roger Pfau with the cup symbol of his being named "Man of the Year" of the Southern Rubber Group

Banquet Program

At the banquet G. E. Popp, of Phillips Chemical and treasurer of the Rubber Division of the American Chemical Society, acting as the official representative of the Division, welcomed and recognized the Southern Rubber Group as a sponsored Group in the division. This meeting marked the second anniversary of the Group.

Another feature at the banquet was the awarding of the Harmon Connell Scholarship Award. The award was presented by Mr. McKenzie, education committee chairman of the Group, to Henry A. Seyfarth, of Mississippi State College.

The SRG Man of the Year award was also made, and the cup was given to Roger Pfau, C. P. Hall, Memphis, by T. R. Brown, past chairman, Goodrich, Tuscaloosa.

"Business Operations in the Rubber Industry"

Abstracts of the talks presented at this panel discussion and the questions and answers follow:

"Purchasing and Inventory Control," by T. R. Brown.

Over the past 20 years the relation between the buyer and the vendor has changed from a lion and lamb situation to that of two human beings working together for the benefit of both. Today the purchasing people must know the vendor, his manufacturing process, and what he can do in the way of service and delivery. The vendor must know his customer and his needs to be able to fill them properly.

J. P. McKenzie *(left)* presenting the Harmon Connell Scholarship Award of the Southern Rubber Group to the 1958 recipient, Henry A. Seyfarth

The basis for the beginning of a supplier-purchaser relation is usually with a supplier who has technical groups providing a new or better product at equal or lower cost. The pattern of this relation must be maintained as time goes on, and quality of product, delivery, and short-notice service on occasion become the things considered for continued purchases.

The purchasing department must take the responsibility for inventory control within a given organization for greatest flexibility with minimum inventory. With upper management setting the goals the purchasing section must draw up the working plan for inventory groups and projection of requirements. These plans take into account the supplier's location, transportation, availability of product, and

Panel on "Business Operations of the Rubber Industry" *(left to right)*: T. R. Brown, B. Hill, C. D. York *(standing)*, G. J. Sortet, and J. E. Long

monthly requirements. Physical inventories, spot checks, and information on recipe changes or production changes must all be taken into account continually to keep materials on hand without piling up large excesses of unwanted supplies. Items which fail to match the forecast in actual practice over a period of time must be evaluated by technical and production groups along with the purchasing people to find out where the error lies.

Finally and perhaps most important, the exercise of common sense and the ability to get along with people will help make purchasing and inventory control a success.

Q. Do you feel there is much purchasing of standard materials that are not approved on company specifications?

A. No; I feel there is very little of this type of purchasing. If a raw material is not approved to buy, we would be endangering the quality of our finished product. The only way we can be sure of the quality of a raw material is to have it evaluated by our technical departments and placed on the approved list. We then buy to a specific specification.

Q. From the purchasing standpoint, what suggestion can you give to the SBR suppliers?

A. There can be many answers to this question, but I believe we can sum it up in these three points: (1) better and more uniform quality; (2) improved packaging; (3) lower price.

Q. Should inventory control be a responsibility of purchasing?

A. Yes; I believe inventory control should be a responsibility of purchasing. However, we must make sure that they have every opportunity to control it. What I'm driving at is this: in large operations, it is not uncommon to have a department normally called planning and scheduling. It is their responsibility to advise purchasing of the proper requirements and the desired arrival date. In this case, purchasing cannot be held responsible for inventory control. However, if this planning department would report to purchasing, or purchasing would determine the requirements, purchasing can and should be held responsible for inventory control. I believe the latter practice should be followed, because you have a more flexible operation, and a tighter inventory can be maintained.

"Pricing for Profit," George J. Sortet.

The price of any product in theory is a matter of taking the several policies and conditions existing, and by taking cost plus the normal additions for overhead and allowing for seasonal or other fluctuations to arrive at a price for the product. In practice this seemingly simple procedure turns out to be highly complicated.

First, an evaluation of the quality or price level, the method of distribution, and establishment of sales and service policies must be made. Added to this are considerations of demand, trade area and range of coverage, class of trade, price contracts, competition, and patents. Following this a chart is made showing monthly changes in unit costs that might be caused by strikes, vacations, work stoppages, seasonal sales, manufacturing for inventory or other reasons.

After these peaks and valleys on the chart are averaged for the year or other period of time, the straight horizontal line called sales price is superimposed. There should be a space between the flattened cost curve and the sales price if a profit is to be made. Just as the sales policies were analyzed, now the costs must be analyzed for pricing policy. This cost analysis is to show the impact of varying production costs on different production rates, to classify elements of cost, and to determine the break-even point.

Now, in theory, with a total cost divided by the number of units, a unit cost is determined. Then using pricing theory, a price is set which is sufficiently above this cost to allow a reasonable profit after taxes. This theory, however, must be put into practice in a business where more than one product, more than one price, or many styles, sizes, or quantities must also be taken into account. This frequently becomes an enormous problem resulting in an enormous task to solve it.

In the study of pricing, the break-even point should be determined. Some elements of cost are completely fixed regardless of volume; some vary directly with volume; and some vary with volume, but not in direct proportion. Obviously then, for the volume involved, the elements of cost must be controlled so that the break-even point is not exceeded. This allows a profit to be made from the volume of business transacted.

Q. How do you judge when to increase or decrease selling price as costs vary upward and downward?

A. There is no simple or uniform method to determine the time to increase or decrease selling prices. It could be simply stated that as soon as costs rise or fall to the point where profits disappear or become extremely large, action is indicated. The impact of competition, if nothing else, however, usually prevents such situations from developing in the first place.

The impact of competition is a vital force in our economy and usually plays an important part in price considerations. Industry-wide, however, the economics of business have relatively equal impact, and when the time comes for price changes, the industry will likewise recognize it.

Q. Is income tax an element of cost in figuring costs for selling prices?

A. In my opinion income tax is not an element of cost in the usual sense, in figuring costs for selling prices. The imposition of an income tax is a levy on the profits derived from the operation of business. Although it may be that in some calculations it is included as an element for price determination to arrive at a reasonable net profit after taxes, nevertheless I do not believe that income tax, as such, should be considered an element of cost.

Q. Is the break-even point a fixed place in any business?

A. This question can be answered both ways, yes and no. The break-even point is fixed to the extent that as a simple answer it may be said that a business has reached the break-even point where it ceases to earn a profit.

Because the break-even point itself has a practical application, it becomes a movable point, as indicated in the text of my remarks. As business declines and retrenchment in operating costs are effected, the break-even point will change. It is also reasonable to assume that there is a minimum below which the break-even point cannot go and the company remain an operating business enterprise.

"Setting Operating Goals and Measuring Achievements," Balmer Hill, Jr.

The key to the success of an enterprise is the profits. This word, however, may have slightly different meaning to each group in a business organization. To the financier it means earnings on investment; to the chemist it means the ability to design the admixture of a product within the cost limits; and to the production man it means the ability to produce within the schedules given to him. The result is the same in each case. Each is used to judge the achievement of the particular section.

Using the word profits as the key to the discussion: P stands for production, R for research, O for organization, F for finance, I for industrial relations, T for technical divisions, and S for sales or marketing. Each of these groups is assigned goals according to the several functions of the unit. The finance group, while having goals of its own to meet, also serves as the measuring and reporting group for all of the others in terms of the monetary end of the business. It can be readily seen that all must fulfill the functions assigned for the overall project to be profitable or successful. Some of the goals will be of primary importance, and some of secondary importance, but each and every one must be met in large degree for a profit to be realized.

Q. Explain the engineering responsibility in cost control.

A. Engineering in all of its myriad phases is unquestionably the key to a sound, successful cost control program. Once the decision has been reached as to that which is to be produced and as to the various sizes, types, etc., engineering then becomes the primary tool of management in obtaining quality production consistent with pricing, profit, and design limitations. The design of the product necessarily comes within the purview of design engineering and, in many cases, chemical engineering. These same technical engineers are also used quite extensively in the rubber industry to improve upon customer relations by assisting in the development for individual product uses.

In the operations pertaining to production, the industrial engineers have a great deal to say with the methods used, the labor quotas by divisions, as well as machine utilization. The electrical engineers then follow up in designing equipment layout and start-up and shut-down of equipment so as to minimize utility expenses. Further, the mechanical engineering division has the responsibility of maintaining the equipment in proper working order, and in some phases of our industry actually design special-purpose equipment.

It will be noticed that the term "engineering" is used somewhat loosely; however, the profession covers such a large field that in some cases it even extends to the necessity of a salesman having an engineering background. Therefore, as a profession and as an integral part of the design, production, and selling responsibilities in our industry, engineering unquestionably is the major tool in any well-designed cost control program.

Q. What cost element is the most difficult to control?

A. This is a most difficult question as all of us who have had some connection with a cost-control program have had our troubles with particular cost elements. Considering the question from an overall and long-range viewpoint, I, personally, believe it is safe to say that the control of manpower is probably the most difficult.

The reason for manpower being the cost element most difficult to control is the variation in individual abilities and capabilities as compared with other cost elements which have a fairly stable performance. Since this is the only element, generally speaking, which is capable of judgement and its resulting conflicts, plus the fact that humans are in just about every phase of selling, production, engineering, etc., this one element can be considered the predominant X factor in our day-to-day cost-control problem.

"Problems of Distributing and Marketing," J. E. Long.

Distributing and marketing are covered in the areas of sales, forecasting, warehousing, and shipping which represent a very great part of the activities of any company. Using the often stated analogy, a manufacturing company is fashioned like a three-legged stool. One leg is sales; one is production; and the third is finance. All three are esential for the support of the whole. Where does distribution and marketing fit in as part of the three-legged stool?

The basis of good distribution and marketing starts with the sales forecast which is then transmitted into planning. While this must vary with the industry and plant involved it must be a combined effort of all divisions of the company. With sufficient production estimated the plans must then provide for the best methods of warehousing and transportation.

Basic data involved in forecasting involve five common techniques: (1) opinion—estimates of management; (2) estimates by salesmen; (3) statistical sampling and research; (4) historical or past records; (5) correlation analysis—sales of related items. Using these estimates, the problems of distribution, warehousing, and shipping are laid out in advance as much as possible. Routings, carrier, mode of transportation, in-transit time, shipping and/or arrival dates, costs, specifications for handling and packaging are all established prior to the time they are needed.

Even with this advance planning there are problems which remain: proper coordination of orders to a customer for minimum transportation rates, loading time necessary to meet shipping date, development of efficient handling methods, packaging for protection at least cost, loading techniques for speed and use of space with low damage loss, compliance with customer shipping instructions, processing shipping documents, computing and recording shipping data, and finally, if necessary, customer and/or sales notification of delays or discrepancies. The problems in this area are directly relatable to the size and complexity of the operation, but are common to all producers and must be solved for insuring the future of the company.

Q. What factors govern whether a product is shipped from the factory or from a warehouse in the area?

A. All items possible should be shipped from the factory because of the economics involved. It is cheaper to ship direct from production. The main factors, however, are the rate of turnover and sales popularity percentage. A small-volume item of slow turnover should be shipped from the factory to hold down the total inventory and capital investment, especially if the enterprise has more warehouses than factories.

(To be continued)

Correction

Our report on the Joint Army-Navy-Air Force Elastomer Conference, which began on page 399 of our December issue, incorrectly attributed one each of three sessions to "Army Elastomer Program," "Navy Elastomer Program," and "Air Force Elastomer Program." The sessions should have been identified as "Behavior of Elastomers under Unusual Service Requirements," "Basic and Applied Research," and "New Polymers and Their Prospects," respectively. Each service briefly described its program before one session.

ASME Rubber & Plastics Meeting; Engineering Properties of Plastics

The Rubber & Plastics Division of the American Society of Mechanical Engineers held three technical sessions as part of the week-long annual ASME meeting. The R & P sessions took place on December 3 and 4. The meeting was held at the Statler-Hilton Hotel, New York, N. Y.

The 1958 chairman of the division, R. W. Barber, Panelyte division, St. Regis Paper Co., presided at the executive committee meeting on December 3. The officers introduced for 1959 were: chairman, R. D. Stiehler, Bureau of Standards, Washington, D. C.; and secretary, C. H. Adams, Monsanto Chemical Co., St. Louis, Mo.

The chairman reported on the activities of the Rubber & Plastics Division for the year, and the committee heard the reports of the various committees of the division. It was announced that plans are being made to hold a two-session meeting in conjunction with the ASME semi-annual meeting for 1959 in St. Louis. The proposed subject for this meeting will be discussions on the various fibers or materials being used for tire cords or proposed for tire cords.

The papers presented at this session were summarized by D. H. Cornell, General Electric Co., Knolls Atomic Power Laboratory, Schenectady, N. Y. The topics covered by the papers fell into five general classifications. The first consisted of a group of four papers on rubber or plastic materials, some of which were new materials; some presented new information on old materials. The second category dealt with research matters, two papers on basic studies of engineering mechanics as related to plastic materials, and a third on degradation of plastics.

The third grouping took up the very important topic of plastics in combination with other materials. A fourth group presented by the speakers from Case Institute of Technology discussed the problems associated with design and specifications studies on plastics. The final group, consisting of only one paper actually, was the "Review of Developments in Plastic Engineering" which has become a regular feature of the annual meeting program of the Division.

"Epoxy Resins and Their Application as Adhesives," by D. Richart, S. H. Richardson, and C. F. Pitt, Bakelite Co., did a good job of describing fields of application for epoxy resins and emphasized one of the outstanding attributes of this class of materials, i.e., excellent adhesion to many different kinds of materials. This paper is of very great practical value to anyone using, or contemplating the use of, epoxy resins.

"The Strength of Curved-Glued-Laminated Wood Timbers as Affected by Radius of Curvature and Lamination Thickness," by W. J. Finnorn, Timber Engineering Co., and Andrew Rapavi, Bureau of Ships, went into the use of wood and resin adhesives to obtain structures of dimensions not possible of achievement in nature. This paper presents considerable useful information on using this combination of materials in the design of large timber structural shapes. With a steady decline in the timber resources of the country this method gives the design engineer a useful tool in a more effective utilization of the forest crop. These plastic resins provide better structural members with a saving of timber materials.

"Control of Flexural Strength of Glass-Fiber Resin Laminated by Glass-Surface Treatment and Theoretical Implications," by N. M. Trivisonno, B. F. Goodrich Research Center, examined some of the basic considerations in the relation of the reinforcement to the resin and the quality of the adhesive bond between the two. Since reinforced plastics are becoming a very important segment of materials for structural use, studies such as this one are bound to produce superior materials for the design engineer to work with and better products for the manufacturer to sell. This information will be of particular use to the manufacturer of articles requiring light weight but high strength structures.

"Recent Developments in Reinforcement," by W. E.Dirkes, Wright Air Development Center, is another paper on the use of light weight and high strength materials. The U. S. Air Force has, of course, been very interested and has sponsored much work and testing on these materials. The spectacular use made by the Air Force of reinforced plastics for the tremendous radome installations, both airborne and on the ground, gives an indication of the type of possibilities for these materials. Much credit can be given to the Air Force for its work on new uses for reinforced plastics, and this paper summarizes very well the current knowledge in this field.

"Prediction of Load and Creep-Deflection in Beams and Eccentrically Loaded Members," by O. M. Sidebottom and Sangiah Dharmarajan, University of Illinois, should help ward off some of the recent criticism that insufficient mechanical engineering research was being carried out in plastics. This paper shows that highly complex computers are not necessary for the prediction of load and deflection behavior of certain types of structures. It is important to note that the difference beween theoretical and experimental behavior at the end of 1,000 hours of testing was only 7% to 13%. This paper will become a very valuable addition to the knowledge of engineering behavior of plastic materials.

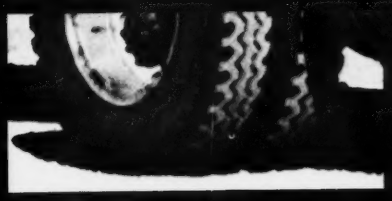
"Room-Temperature Vulcanizing Silicone Rubber, a Versatile New Engineering Material," by R. Treat, Jr., General Electric Co., represents a significant advance for the design engineer. For years engineers have tried to simplify the molds to reduce costs, but now the problem has been attacked by changing the raw material so that it can be fabricated in low-cost molds for small-quantity production lots. The combination of room-temperature cure and heat resistance of the material should make these room-temperature curing silicones of considerable interest to engineers faced with a need of heat-resistant materials that can be easily used in his finished machine or structure. The paper presents data quite adequate for the design engineer.

"Some High-Speed Tensile Properties for Thermoplastics," by R. E. Ely, Army Rocket & Guided Missile Agency, Redstone Arsenal, presents more material of high-quality theory and data of an engineering nature to be added to the store of information on plastics. This paper shows the results of very careful planning, high-quality experimentation, and a good grasp of the instrumentation problems associated with high-speed test work. It represents a major contribution to basic engineering knowledge of plastic materials. This is another paper to refute the criticism that insufficient research is being conducted on mechanical engineering of plastics.

"Designing with Delrin Acetal Resins," by W. C. Warriner, E. I. du Pont de Nemours & Co., Inc., provides some engineering data on a polyoxymethylene resin derived from formaldehyde. That plastics have become of age and moved away from the dime-store variety novelty application field is demonstrated by the author's comparison of the design economies possible wherein "Delrin" acetal resin has replaced some types of aluminum and zinc in die casting. The type of information presented is further evidence that the plastics industry is developing an awareness of the needs of the designer with regard to definition of the engineering behavior of new materials.

"Applications of Solid Polyure-

From here

to here 

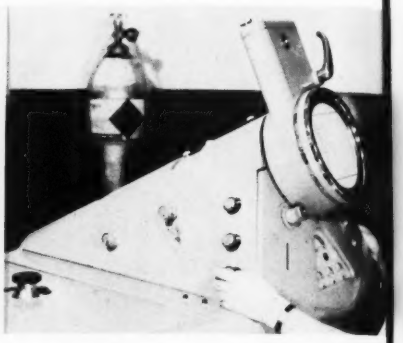
Furnex® SRF means optimum balance all the way!

TURN PAGE

Because COLUMBIAN goes all the way

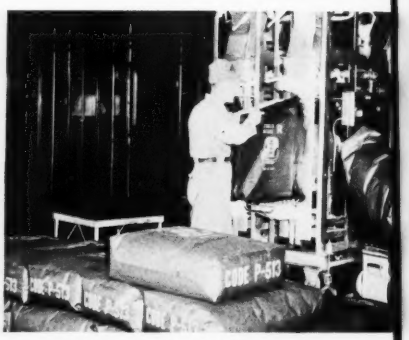
in RESEARCH .....

Columbian's laboratories have developed many "firsts" in the endless search to make carbon blacks that meet the most exacting specifications. Typical is Columbian's contribution in determining the micromorphology of carbon-reinforced rubber. The *first* electron microscope in North America was built by Columbian to see and measure the size of carbon black particles . . . leading to an entirely new concept of structure—a major tool today in carbon black evaluation.



in PRODUCTION .....

Columbian has pioneered many new methods of precise production control . . . to provide uniformity bag after bag, carload after carload. In addition, Columbian offers a wide range of blacks to match any requirement where rubber with special characteristics is desired . . . a range of blacks that assures superior results in end products.



in TECHNICAL SERVICE

For years, Columbian's Technical Service has been considered outstanding in the industry . . . is always available to study any phase of production . . . to contribute workable, practical ideas that can lead to greater economy, efficiency and improved products. Backed by the most modern laboratories and unequaled field experience, Columbian's Technical Service is a potent reason for specifying Columbian carbon blacks!

Columbian has a carbon black for every need . . .

STATEX®-160 SAF Super Abrasion Furnace
STATEX-125 ISAF Intermediate Super Abrasion Furnace
STATEX-R HAF High Abrasion Furnace
STANDARD MICRONEX® MPC Medium Processing Channel
MICRONEX W-6 EPC Easy Processing Channel
STATEX®-B FF Fine Furnace
STATEX-M FEF Fast Extruding Furnace
STATEX-93 HMF High Modulus Furnace
STATEX-G GPF General Purpose Furnace
FURNEX® SRF Semi-Reinforcing Furnace

COLUMBIAN CARBON COMPANY
380 MADISON AVENUE, NEW YORK 17, N. Y.
Branch offices and agents in principal cities

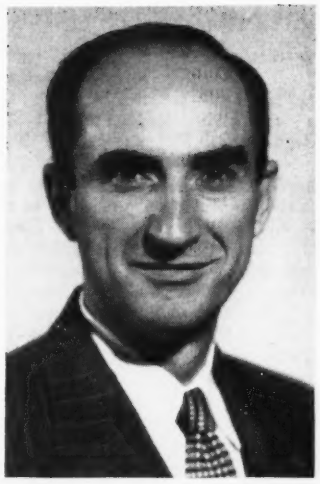
thane," by K. H. Grim, Disogrin Industries, Inc., was divided roughly into two parts. In the first section of the paper the author discussed the preparing of the raw materials. He dealt in some length with the proper methods for preparing the materials to be used in solid applications. The second portion of the paper discussed the applications of this material in the field with several descriptions of the types of articles made.

"Review of Developments in Plastics Engineering, 1957-1958," by R. A. Clark and R. I. Leininger, Battelle Memorial Institute, is a regular feature of the annual meeting of the ASME Rubber & Plastics Division. These papers are excellent reference sources for engineers. The authors have succeeded in concentrating the literature on this subject for the previous year and have included a most useful bibliography.

"Polymers Are Not Products in Plastic Fabrication," by J. E. Tollar, The Dow Chemical Co., hit upon a very important theme. It is believed that the descriptions of how polymers are processed and the methods of preparing them and of utilizing them should be circulated to cover the plastics field. Such information would be helpful to engineers and particularly to engineering educators.

"Molecular, Microscopic, and Macroscopic Structural Data in the Design of Plastics Molding Compositions to Fit Service Specifications," by R. M. Evans, The Master Mechanics Co., and E. G. Bobalek, Case Institute of Technology; **"Significance of Physical Test Methods in Interpreting Design Properties of Plastics,"** by R. M. Evans, Master Mechanics, and S. M. Skinner, Case; and **"Chemical Degradation and Mechanical Testing of Polyethylenes,"** by J. N. Henderson, T. T. Serafini, and E. G. Bell, Case Institute, discussed some of the problems of design and specification criteria. The work described was done at Case Institute of Technology on a project sponsored by the military. It had as its broad objective the study of the usefulness of plastics materials in various medical applications in the Armed Services. The authors concluded that tests measuring tensile, torsion, damping, and certain chemical properties are sensitive techniques for measuring changes in structural integrity. This observation corroborates that of earlier workers in the field.

"The Liaison Problem of the Translation of Laboratory Design Data into Production Practice," by Robert Gelin and R. F. Toomey, Case Institute, and William Ellslager, The Glidden Co., discusses a very difficult subject. It demonstrates that scientists can deal with inexact sciences, particularly in the problem analysis field. They found that the solution to many of the problems of translation dealing with solutions can best be handled by the use of case histories.



R. D. Spiehler, 1959 chairman

"Important Design Considerations for Reinforced Plastics," by Harry Nara, Case Institute, related very appropriately to the papers above by Trivisonno and Dirkes. This helped illustrate the important point that despite the availability of much engineering data on any material, it cannot and does not achieve widespread acceptance until a substantial backlog of field experience has been accumulated. This paper helps to correlate some of this field experience.

NYRG Christmas Fete

The New York Rubber Group held its annual Christmas party at the Henry Hudson Hotel, New York, N. Y., on December 12, with approximately 500 in attendance. The program for the evening included a cocktail hour, dinner, entertainment, and the drawing of prizes.

Following dinner, C. V. Lundberg, Bell Telephone Laboratories, past chairman, announced officers for 1959 as follows: R. B. Carroll, R. B. Carroll, Inc.; chairman; Irvin S. Kern, R. T. Vanderbilt Co., vice chairman; R. G. Seaman, RUBBER WORLD, secretary-treasurer; and sergeant-at-arms, E. T. Heckman, Raw Materials Co. Executive committee members, three-year term, are: W. J. O'Brien, Seamless Rubber Co.; E. C. Strube, Crescent Insulated Wire & Cable Co., Inc.; A. H. Woodward, E. I du Pont de Nemours & Co., Inc.; and Bryant Ross, Frank B. Ross Co., Inc.

Music and entertainment were provided by Ray Bloch Associates. The party was concluded by the drawing of more than 100 door prizes donated by 99 different companies.

E&PG Field Trip

The Elastomer & Plastics Group of the Northeastern Section, American Chemical Society, held a field trip on November 18, to Ashton, R. I., where 80 members and guests were conducted through the drawing and finishing plants of Owens-Corning Glass Co.

In addition, the laboratories for both physical and chemical testing were examined; the chemical development and design laboratories were visited; and the sales display of hundreds of glass and plastic products were seen and discussed.

Each step in the production of fiber for mat, continuous filament, cut fiber and mica-like, latex-bound insulation was in operation, and treatment of fiber in the continuous filament with latex and with plastisol was demonstrated. Finished woven products ranging from tapes and heavy duck to window screening and fancy drapery material were observed in the process of manufacture in the development department.

Following the conducted tour, led by development personnel of the company, the group was served coffee and doughnuts in the company cafeteria. The visitors were impressed with the extensive effort made by the company to instill safety into all phases of the operations, and the ever-present posters on the subject were considered very effective.

NCRG Holds Xmas Party

Officers for 1959 of the Northern California Rubber Group were installed at the annual Christmas party held on December 6 at the Orinda Country Club, Orinda, Calif. Drace Kutnewsky, Burke Rubber Co., succeeds W. H. Deis, Merck & Co., Inc., as the new chairman. Other officers are vice president, C. C. Corkadel, Oliver Tire & Rubber Co.; secretary, Raymond Brown, Burke Rubber; treasurer, Joseph L. Mattson, Witco Chemical Co.; and three directors, as follows: Keith Large, Oliver Tire; Vic Carrier, Mansfield Tire & Rubber Co.; and Virgil Price, Burke Rubber.

The party, with Keith Large as chairman, featured dinner, dancing, orchids and favors, and door prizes for the 70 couples who attended the affair.

"Specialty Nitriles," Topic At R. I. Rubber Club

The Rhode Island Rubber Club met November 6 at the Pawtucket Country Club, Pawtucket, R. I., and 231 members and guests heard David E. Welch, Naugatuck Chemical Division, United States Rubber Co., speak on "Paracril Ozo," and N. G. Duke, B. F. Goodrich Chemical Co. talk on "Carboxylic Modified Nitrile Rubber." Following was a dinner at which Dr. Smiley, Brown University, presented a most entertaining talk, "Present-Day Russia."

New Officers

It was then announced that Kenneth Priestley, Kaiser Aluminum Co., has been appointed chairman of the special twenty-fifth anniversary outing which is to be held June 12-14, at the Belmont, West Harwich, Cape Cod, Mass.

Officers elected for 1959 are as follows: chairman, H. Webster Day, E. I. du Pont de Nemours & Co., Inc.; vice chairman, Harry Ebert, Firestone Rubber & Latex Products Co.; and secretary-treasurer, Walter J. Blecharczyk, Davol Rubber Co. Directors include: Edwin C. Uhlig, U. S. Rubber; Ralph Robitaille, Phillips Chemical Co.; Joseph Vitale, Crescent Corp.; Clement D'Amicone, Acushnet Process Co.; and Joseph Donahue, The Goodyear Tire & Rubber Co.

Nitrile Rubber-PVC Blend

D. E. Welch, in commencing his talk, stated that Paracrils, copolymers of butadiene and acrylonitrile, are synthetic rubbers with many excellent properties. Among these are oil-resistance, abrasion resistance, and heat aging, but certain deficiencies such as lack of ozone resistance and flame resistance tend to limit the usefulness of Paracrils.

By combining polyvinyl chloride with Paracril a product is obtained which has excellent ozone resistance and a fair degree of flame resistance. This product is called Paracril Ozo.

Paracril Ozo retains, actually improves on, the excellent oil-resistance and abrasion resistance of medium nitrile Paracril. On the other hand, PVC makes Ozo more difficult to compound for low compression set than regular Paracril, and its aging characteristics above 250° F. are not as good.

Ozo compounds can be compounded with the same ingredients as regular Paracril, and they are treated as 100% vulcanizable materials.

A basic difference, however, is that a pure gum Paracril will have a tensile of 200-300 psi.; while Ozo, because of the reinforcement of the vinyl, has a pure gum tensile of 2,500 psi. Thus, while medium or large particle size fillers reinforce Paracril to some extent, such loadings actually degrade Ozo when measured in terms of tensile strength. Properties such as abrasion resistance may be improved.

Fine particle size carbon blacks and non-black pigments such as Hi-Sil 233 improve the tensile strength of Ozo. With HAF or MPC black tensiles close to 4,000 pounds are obtained without excessive loading. Softer blacks and such non-black pigments as clays and calcium carbonates are very useful for reducing costs and sometimes improving processing.

Ester plasticizers such as DOP, the adipates, etc., are usually required for Ozo compounds rather than the common processing oils. By the use of thiurams and guanidines, very fast curing Ozo compounds are possible. Conventional mixing techniques are used with Ozo although some factory experience may be necessary with a new compound.

Extrusions with Ozo are smooth, and rates, particularly in wire work, are very high. Calender shrinkage is low, and an extremely smooth sheet is obtained. Mold definition is excellent.

Ozo is being used commercially in shoe soles, wire jackets, calendered sheeting, hose jackets, and many molded and extruded mechanical goods items.

Carboxylic Nitrile Rubber

Mr. Duke, in his talk on carboxylic modified nitrile rubber, stressed that while nitrile rubber has been the workhorse of the oil-resistant rubbers for nearly 20 years, improvements made during this time were in the direction of improved processibility with only minor changes in physical properties. The first major break from this tradition commercially has been the chemical modification of nitrile rubber through the introduction of carboxylic groups among the polymer chain. To build these reactive acid sites along the chain, unsaturated acids such as acrylic acid or methacrylic acid are used to replace a portion of the acrylonitrile normally used.

The carboxylic modified nitrile rubber is capable of the normal sulfur cure generally used with unsaturated polymers. In addition, the carboxyl groups provide active sites for crosslinking through salt formation with polyvalent metal oxides or their salts. Zinc oxide is particularly effective and is the most commonly used material for this purpose.

Zinc oxide can be used as the sole curing agent for the carboxylic-type polymer to produce vulcanizates of high gum strength, although they possess poor set properties. To overcome this latter difficulty, it is preferable to combine the zinc oxide cure with a conventional cure. Since most conventional cures, except the peroxide type, usually contain zinc oxide in the system, a combination cure using normal acceleration system is almost unavoidable.

The mixing and processing of the carboxylic rubber are similar to those of normal nitrile rubber with the exception that the zinc oxide is added last to prevent scorching.

Hycar 1072, a carboxylic modified polymer, can be compared with its nitrile counterpart, Hycar 1042, in a simple conventional recipe. The modulus, tensile, and hardness of the Hycar 1072 vulcanizate are higher than those of Hycar 1042. Elongation for Hycar 1072 is lower at room temperature and higher at elevated temperatures such as 212 and 300° F. than for Hycar 1042. Tear strength of 1072 is higher at both room and elevated temperatures. Hycar 1072 shows unusual resistance to low-temperature brittleness; the ASTM D-746 values are 20° F. lower than for 1042.

The abrasion resistance of Hycar 1072 is outstanding. NBS abrasion values of 400 to 800 are common, and values over 1,200 have been reported. Such excellent performance has been confirmed by field testing. Also, Hycar 1072 has improved resistance to ozone, being seven to ten times more resistant to ozone than similar Hycar 1042 stock.

The presence of carboxyl groups in the nitrile polymer appears to influence the character of blends with PVC and phenolic resins. Hycar 1072-Geon PVC blends are reported to mix faster by up to ⅓ of the time than for that using a normal nitrile rubber in the blend. The extrusion of such Hycar 1072-containing blends are much smoother than Hycar 1042-containing blends.

Other advantages of carboxyl-vinyl blends are: improved low-temperature brittleness, improved abrasion resistance, and greater thermoplasticity. Carboxyl-phenolic blends exhibit greater compatibility and reinforcing action than normal nitrile-phenolic blends. Also, such advantages have been gained with Hycar 1072 at no loss in the oil resistance of the rubber. If anything, the oil and fuel resistance is slightly improved, and resistance to water, ethylene glycol, and alcohol is significantly better.

Applications of Hycar 1072 include: soles, heels, top lifts, mud pump pistons, drill pipe protectors, and hose covers. Blends with vinyls show promise for cable jacketing and sponge.

The zinc oxide cure has been used to advantage in cements. Ammonia is added to the MEK solution of Hycar 1072 containing about 10 phr. zinc oxide. The ammonia stabilizes the cement, prevents gelling, and volatizes when a film is cast or dipped, forming a tough cured film.

Many new products and many old products improved are expected in the future through the use of carboxylic nitrile rubbers.

NBR-PVC Blends Fort Wayne Topic

The second meeting of the Fort Wayne Rubber & Plastics Group for the 1958-1959 season was held in the Van Orman Hotel, Fort Wayne, Ind., on December 4. The 198 members and guests present were treated to an oyster bar, courtesy of O'Conner & Co.,—followed by a smorgasbord.

The technical session of the meeting consisted of a paper by N. S. Beekley, Goodyear Tire & Rubber Co., Akron, O., on "Thermoplastic PVC-Nitrile Rubber Compounds."

Having come into prominence during World War II during the shortage of rubber and being processible on rubber machinery, poly(vinyl chloride) resin has been called the rubber manufacturer's plastic. This material is not of much use by itself, but when mixed with plasticizers, it exhibits rubber-like properties. Lacking double bonds, it is quite resistant to exposure and to chemical attack and may be produced in clear or colored compounds.

In some applications there is a desire for certain properties which have been obtained using butadiene-acrylonitrile polymers as plasticizers for the PVC. While NBR is not a very efficient plasticizer when compared with ester plasticizers, it does provide a combination of interest in certain applications. It has been quite difficult to process this combination because long breakdown periods are required for the nitrile, and excessive frictional heat build-up takes place in processing. This condition results in degraded PVC and excessively crosslinked nitrile rubber.

In order to eliminate or at least modify these processing problems it was proposed to produce PVC and NBR which would be more compatible with each other. According to the author of the paper, Goodyear produced a low molecular weight PVC which it designated Pliovic S50 and an easy-processing NBR designated Chemigum N8. The combination of these two materials can be readily accomplished and will solve many of the processing problems, according to Goodyear. Effective procedures have been developed for both Banbury and mill mixed methods. The mill must be heated, but otherwise standard equipment can be used.

The compounds are recommended for use where hydrocarbons or other troublesome chemicals must be withstood by the rubber-like product. Many compounds have been tried, and a range of properties is available. Different ratios of rubber to PVC and the addition of antioxidants and vinyl stabilizers as well as other plasticizers give the necessary range of properties. Where other types of combinations requiring thermoplastic blends have not been too satisfactory owing to processing problems, these new materials are recommended.

Silicone Rubber Technology and Reclaiming Feature Chicago Group November Program

The Chicago Rubber Group meeting held on November 14, featured a double-barreled discussion on silicone rubber. The meeting was held at the Furniture Club, Chicago, Ill., with about 235 members and guests attending. The evening dinner-meeting heard a talk on traffic safety. Frank R. Burrows, Jr., Chicago Citizens Traffic Safety Board, spoke on "Solution or Problem—There Is No Magic to It."

The technical session held at 5:00 p.m. heard talks on silicone rubber reclaiming and new developments in silicone. Ben R. Wendrow, U. S. Rubber Reclaiming Co., Buffalo, N. Y., dealt with "Reclaiming of Silicone Rubbers and Special Polymers"; while Joe C. Caprino, Silicone Products Division, General Electric Co., Waterford, N. Y., discussed "New Developments in Silicone Rubber Technology."

Silicone Rubber Reclaims

Mr. Wendrow told the Group some of the benefits derived from scrap silicone and some other features of its growing use. This subject was covered in a paper by this author which appeared previously in RUBBER WORLD.[1]

Good reclaim can be made from any silicone, but the most uniform comes from post-cured stock. The important requirement is to segregate the scrap, according to state of cure, since different degrees of treatment are used for the different grades of scrap.

Blends of reclaim and virgin stock may be used with up to 20% reclaim without added cure. More than 20% usually requires added cure for best results. Other beneficial properties of the blends are lower shrinkage in molding, better compression set, better milling and processing in many cases, and with newer reclaims added improvement in extrusions.

New Silicone Rubber Technology

Mr. Caprino listed some of the improvements which have been made in silicone rubbers. Some of these improved physical properties were made during the first ten years of silicones existence commercially (1944 to 1954), but the major advances have come since 1954, particularly in improved processing types. Silicones are now offered which have higher strength, lower compression set without toxic additives, better flame resistance, more conductive to electricity, better oil and fuel resistance, and which are better able to withstand higher temperatures.

In processing, curing of thick sections has been accomplished; extrusion speeds have been increased, and calendering has been improved. New elastomers are produced which have shrinkage in the same range as organic rubbers opening many applications in the molding field.

The future has many promises for silicones, with one of the first improvements expected lying in the field of better oil and fuel resistance combined with high strength at elevated temperatures.

Questions and Answers

Q. How effective is reclaimed silicone rubber used in mechanical goods?

A. Wendrow. Silicone rubber reclaim is very effective in aiding molding of silicone rubber mechanical goods parts. Users have reported that they had trouble getting certain silicone rubber compounds out of the molds, but when they added silicone rubber reclaim, the removal was made somewhat easier. Also, in the case of undercut molds the reclaim has been an aid in the removal of the part.

Q. How can a silicone rubber be applied to a steel roller to obtain an extremely smooth finish?

A. Caprino. The method recommended involves applying the compound in layers, wrapping with fabric and a steam cure. Then the silicone rubber roll can be ground in the usual way. Silicone rubber rolls grind well —even those of 50 to 60 Shore A durometer.[2]

Q. Is it possible to mix different silicone polymers in reclaim?

A. Wendrow. Yes, if you keep the same state of cure and hardness together. If this is not done, the reclaim will tend to be hard in spots.

Q. Is there a silicone rubber with less compression set than nitrile rubbers at 300° F?

A. Caprino. Yes, on certain special silicone rubbers the compression set at 300° F. is extremely low.

Q. Is silicone reclaim available freely, or is it all a custom business?

A. Wendrow. At present silicone rubber reclaiming is on a custom basis. As the industry expands, no doubt the material will become available from stock.

Q. Does silicone rubber reclaim have any residual moisture?

A. Wendrow. There is a trace of moisture left in most silicone rubber reclaim.

[1] Aug., 1958, p. 738.
[2] Shore Instrument & Mfg. Co., Inc., Jamaica, N. Y.

Tlargi Hears Partridge

Members and guests of The Los Angeles Rubber Group, Inc., Los Angeles, Calif., attended a technical dinner-meeting at the Biltmore Hotel, Los Angeles, on November 4, hearing at the technical session E. G. Partridge, director of the TLARGI Foundation, speak on "Latex Technology," and being entertained at the dinner by the Mitchell Boys and Bob Mitchell, a unique musical group.

Dr. Partridge commented that while the main activity of the rubber industry is manufacturing from solid rubber, a smaller but interesting part is concerned with the manufacture of articles directly from liquid latex. About 13% of the natural rubber and about 7% of the synthetic rubber used in the U. S. is in the form of latex.

Manufacture of products directly from latex has several advantages over solid rubber, including the use of cheaper equipment requiring less power; stronger products because the rubber is not broken down before use; fast, low-temperature cures; and production of complicated and unique articles not practical by molding of solid rubber.

Compounding principles are similar to those in solid rubber with some exceptions, chiefly the necessity of adding all ingredients in dissolved or dispersed form and the lack of reinforcement by fine pigments such as carbon black.

Products are made from latex by a variety of processes: latex compounds may be used directly as adhesives, coatings, or impregnants for paper, fabric, cord, or fibers; articles such as prophylactics or insulated wire are made by drying a thin film on a form or wire; surgical items, gloves, drug sundries, balloons, and toys are produced by dipping forms into a chemical coagulant and then into a latex compound. Also, toys and other articles are manufactured by casting the latex compound in a porous mold; foam is made by introducing air or a chemical blowing agent into a latex compound; and thread is produced by extruding a latex compound through a fine orifice into a coagulant or by slitting a coagulant dipped sheet.

The entertainment group at the dinner meeting consisted of the Mitchell Boys and Bob Mitchell, a musical group which was equally at home in all phases of vocal music. Since the organization's inception in 1934 as a church choir, it has been increasingly active in ever-widening fields of music. In addition to singing regularly at various churches in the L. A. area, the Mitchell Boys make frequent personal appearances and have made nearly 100 motion pictures.

Bill Ireland, The Firestone Tire & Rubber Co., also announced the winners of the various prizes distributed at the meeting.

Tech A Report

January 1 was the target date for completion of the proposed expanded tabular system for a master rubber specification by the SAE-ASTM Technical Committee on Automotive Rubber. The proposal combines existing SAE 10R and ASTM D 735 tables into a single specification which is to consist of two tables: one of all current basic tables, and the other of all current suffix tables.[1]

The new system which is being coordinated with the Defense Department's rubber specification program offers a more flexible way to incorporate new polymers and polymer blends.

Upon completion of the proposed table, an effort will be made to fit both solid and cellular rubber compositions into the new system.

FLUID AGING. The validity of ASTM Method D 471 (Changes in Properties of Rubber and Rubber-Like Materials in Liquids) has been re-established. Members blame improper application of this method for the reported discrepancies in test results.

Plans have been made to immerse Viton A and various polyacrylate compounds in five gear lubricants for 70 hours at 300° F. Results of this and other time-temperature immersion studies were reported at the TCAR's December meeting, but as of yet are not available

COMPRESSION SET. The practicality of shortening the current test time from 70 to 22 hours is under final ballot. The new compression set test time will apply to Classes SB and SC for both basic and suffix B requirements. Tech A work has revealed that the 22-hour-at-212° F. test gives compression set results that are approximately ⅔ of the values given by the present 70-hour test.

OTHER. Round-robin testing of approximately 12 rubber compounds is under way to determine the adhesive qualities of vulcanized rubber to metal.

Tear tests are being conducted on mats made to SAE 705 staining, SAE 705 non-staining, and SAE 709. Conditioning will be for six hours at 158° F. The mats will be tested with and across grain.

An ozone exposure test procedure is being finalized since nine laboratories reported substantial agreement on tests of two neoprene compounds exposed for 24, 48, and 72 hours at 100° F.

Neoprene latex film tables have been established. Eventually they will be expanded to include natural rubber and nitrile latex films.

[1] RUBBER WORLD, Aug., 1958, p. 749-50.

CALENDAR of COMING EVENTS

January 12-16
Society of Automotive Engineers. Annual Meeting and Engineering Display. Sheraton-Cadillac and Hotel Statler, Detroit, Mich.

January 23
Akron Rubber Group. Sheraton-Mayflower Hotel, Akron, O.
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

January 26-29
Plant Maintenance & Engineering Show. Public Auditorium, Cleveland, O.

January 27-30
Society of Plastics Engineers, Inc. Fifteenth Annual Technical Conference. Hotel Commodore, New York, N. Y.

January 30-31
Southern Rubber Group. Statler Hotel, Dallas, Tex.

February 2
Washington Rubber Group. Army-Navy Club, Washington, D. C.

February 2-7
Fifth Annual Tire Dealers' Management Program. University of Akron, Akron, O.

February 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

February 4-6
American Society for Testing Materials, Committee D-11. Pittsburgh, Pa.

February 6-8
Boston Rubber Group. Annual Ski Week-End. White Mountains, N. H.

February 12
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

February 13
Connecticut Rubber Group.

March 30-April 1
American Physical Society. Cambridge, Mass.

March 31-April 2
Division of High-Polymer Physics, APS. Cambridge, Mass.

WASHINGTON REPORT

By JOHN F. KING

Rubber Industry Absent from Review Of Policy on Foreign Earnings

Congressional tax experts are wondering what happened to the rubber industry's representation in Washington when the House Ways and Means Committee, one month before the 86th Congress convened, began looking into the government's policies governing taxation of foreign earnings of American companies.

Few industries in the United States economy have as great a stake in foreign operations as the rubber industry, Congressional sources point out. Why then haven't the rubber companies come forward with their ideas on this important subject, they ask. The industry was invited to offer suggestions, but it declined.

The question is significant inasmuch as rubber, as well as every other industry with important foreign holdings, faces the prospect in the new Congress of punitive, "liberal"-oriented tax legislation. At the same time, the industry stands the chance to gain substantial tax benefits on foreign income. The decision could go either way. Powerful political forces already are contending the issue of whether business—particularly foreign investment—should get a tax break, or whether it should be squeezed harder for more tax revenue to moderate the shock of a $12-billion federal deficit in fiscal 1960. The issue has split the Administration, and a similar division already is apparent among the ruling Democrats in Congress.

Opposing Government Views

In the Executive Branch, the Departments of State and Commerce are pushing hard for new tax incentives for foreign investments, new and old. State and Commerce see in new tax privileges the means to speed more private capital—and with it crucially needed managerial know-how and the philosophy of the American enterprise system—into economy-building investments abroad, especially in the economically backward nations which figure so importantly in the Cold War.

The Treasury Department, however, is unwilling to part with expected tax revenue in the face of massive budget deficits that loom not only in fiscal 1960, but 1961 as well.

In the House, where tax legislation must originate, a similar difference shows through, though this division is not so clear-cut as in the Administration.

Chief tax policy maker of the lower chamber, Chairman Wilbur D. Mills (Dem., Ark.) of the Ways and Means Committee, already has served notice he will devote himself in the 86th Congress to stopping revenue leakage and plugging loopholes in the existing federal tax structure.

He did not say so, but it is understood Mills has his eye peeled for tax savings in preferences already accorded foreign investment. The speculation here centers on Mills' reported desire to trim down the so-called depletion benefits now enjoyed by the international oil and chemical companies. But it is entirely possible the Arkansan also may go after other aspects of tax privilege which are scattered through the internal revenue code. Here is where the rubber companies, for example, could end up substantially disadvantaged.

Pulling the other way from Chairman Mills is Rep. Hale Boggs (Dem., La.), a senior Democrat on the Ways and Means Committee who is devoted to the idea of giving foreign investors, the established operators and the newcomers, new incentives to go abroad. While he is junior to Mills in Democratic decision-making, the popular and persuasive Boggs—who frequently is mentioned as Speaker Sam Rayburn's successor as boss of the House of Representatives—has the resources to hold his own in any arguments with Mills. Boggs, moreover, has an edge should a fight develop over foreign tax policy. He headed the Foreign Trade Subcommittee's December hearings on foreign investment policy which produced unanimous agreement among national and international business organizations and companies for tax relief on foreign-source corporate income. The 50-odd witnesses at the hearings, representing some of the largest corporations in the world, appealed almost to a man for special consideration in foreign tax policy.

Viewpoint of Business

Industry's arguments were many and varied, but they boiled down to the common viewpoint that a higher level of private capital outflow to the world is in the national interest, both in terms of bolstering the United States economy and of giving free world countries a boost up the economic ladder. Stronger economies abroad, the consensus held, means better foreign customers for U. S. business. Moreover, it continued, in the present stage of foreign economic development, American companies are being compelled to invest abroad to hold on to traditional foreign markets and to exploit new ones.

But where, the question is asked, were the rubber companies when all this was going on?

No tabulation of the American rubber industry's foreign holdings are readily available, but certainly they are extensive, perhaps of paramount importance in keeping the industry in a healthy earnings position. The 1957 financial report of the Goodyear Tire & Rubber Co., for instance, boasts of the "steady growth which has been evident for the past 47 years" in Goodyear's overseas activities. Goodyear has 22 production plants in 21 foreign countries—and 29 domestic production facilities. It also has special arrangements with rubber companies in another five nations for production of rubber products under licensing and other agreements. United States Rubber Co. through its international division has its own or affiliated plants in 13 countries and sales branches in 32 nations around the world. Even the smaller companies such as Seiberling Rubber Co. are emigrating. Seiberling's 1957 financial report calls Seiberling of Canada one of its "fastest-growing and more profitable units."

Rubber Attitude Puzzles Congress

With this wealth of experience in the foreign field, asks a Congressman friendly to the idea of new foreign-income tax benefits, why couldn't the industry have given the Boggs Subcommittee a hand in building a record to support relief legislation?

The Congressman, who does not

care to be identified, is hard put to forecast what might come out of Congress in the way of benefits, if anything at all. He points out that witnesses before the Boggs Subcommittee, while most interested in a reduction of corporate levies on foreign source income, were realistic enough to seek what is "possible." So instead of reductions, he believes the issue will center on working out some sort of "deferral" arrangement which allows a firm to postpone payment of U. S. taxes until it actually repatriates the revenue for use at home or for distribution among shareholders.

The idea of the deferral device would be to give the American parent company more flexibility in its planning and actual operations abroad. While it is currently possible to obtain deferral by the expedient of setting up a "base" corporation—under the laws of a "tax-haven" country such as Lichtenstein—to handle all the American parent's overseas business, established American companies in the foreign field, such as those of the rubber industry, cannot always obtain the same benefit. American-chartered foreign subsidiaries, or foreign branch plants, may not defer tax payments until the earnings are distributed. The tax applies at once.

Sponsors of the deferral plan believe that if foreign earnings were not subject to the immediate 52% corporate tax—or the 38% levy if the firm involved is a "Western Hemisphere Trade Corporation"—then the inducement to plow back earnings into plant expansion could produce a significant upswing in economic activity within the host country. Deferral, moreover, would provide fresh incentives to invest the earnings from one foreign property into new, market-building investments in other, third countries.

While the deferral plan "will not win the Cold War," the Congressman says, it could produce a new "development spiral" abroad that, in combination with other measures, could double private American foreign investment in the next 10 years.

"It's not impossible," he said. "American business holdings abroad nearly doubled from $19 billion in 1950 to over $36 billion by 1957."

These are Commerce Department statistics, which also show that new investments between 1950 and 1957 rose from about $1.2 to well over $4 billion a year.

Administration Tax Conventions

Whether or not legislation for broader deferral rights can be worked out in the coming session, the Executive Branch by the use of its constitutional treaty powers will move ahead on another front of tax policy to offer private business new inducements to go abroad.

The Administration currently is negotiating tax conventions with a number of less-developed countries in Latin America and Asia featuring "tax-sparing" provisions. A new wrinkle in standard no-double-taxation treaties, "tax-sparing" provides that the host country, say Peru, agrees to forgive or waive all taxes on new American investments for a period of, say, five years. Under the treaty, the United States is bound to credit Peru's statutory corporate tax rate, even though it is not imposed during the five years, against the company's United States tax rate.

There are indications the Senate may balk at tax-sparing treaties as an unwarranted invasion of Congress's right to "levy and collect taxes" by a too-liberal use of executive treaty powers. But the Administration will push ahead with the treaties, although there is no way to predict whether Peru or any other country could see its way clear to giving "foreigners" special privileges and incidentally losing revenue into the bargain. Tax-sparing arrangements will be limited to less-developed countries inasmuch as the object of tax privileges in the first place is to provide an appropriate lure to private capital to go into "high-risk" countries.

NSF Science Information Service Organized; NAS To Review Government Science Programs

The National Science Foundation in mid-December announced the establishment of a Science Information Service to make scientific literature in all languages readily available to scientists and engineers. In line with orders from President Eisenhower, also issued last week, the new NSF service, under Burton W. Adkinson, is designed to take the lead in bringing about better coordination of the multifarious scientific information activities within the Federal Government.

Commerce-NAS Science Survey

At the same time NSF launched its indexing, translating, and abstracting service to provide Western technicians the science publications of East and West, the Commerce Department and the National Academy of Sciences jointly announced new steps to gear the scientific programs of the Commerce Department "to the rapidly changing needs of science and industry."

The Joint Commerce-NAS move involves the appointment of a special committee of science and research experts, under the chairmanship of Mervin J. Kelly, president of Bell Telephone Laboratories, Inc., to study the requirements of science and industry for services of the type Commerce can provide. The advisory committee also will recommend new or improved means of relating Commerce Department programs to the latest developments in scientific information collection. Chiefly involved will be the Office of Technical Services, which last August set up a Foreign Technical Information Center to catalog and publish Russian and other foreign technical publications. The Commerce-NAS advisory committee also will survey related operations of the Commerce Department's Patent Office, National Bureau of Standards, and other agencies.

Charged with submitting a report by June 1 are the following members of the Committee: Prof. Horace R. Byers, Department of Meteorology, University of Chicago; Dr. H. A. Leedy, Armour Research Foundation, Illinois Institute of Technology, Chicago; Dr. C. Guy Suits, vice president and director of research, General Electric Co. research laboratories, Schenectady, N. Y.; Prof. Abel Wolman, The Johns-Hopkins University, Baltimore, Md.; Dr. Augustus Kinzel, vice president (research), Union Carbide Corp., New York, N. Y.; Dr. Michael Ference, Jr., director of engineering staff, Ford Motor Co., Dearborn, Mich.; and Frank W. Herring, Deputy Director for Comprehensive Planning, New York Port Authority, New York. John C. Green, director of Commerce's Office of Technical Services, has been named executive secretary.

NSF Information Service

The NSF's Science Information service is charged with arranging for indexing, abstracting, translating, and other services "leading to a more effective dissemination of scientific information." It also is under orders to "develop new or improved methods, including mechanized systems, for making scientific information available" to scientists.

Meantime, it is known that the Commerce Department's OTS already has published abstracts of the complete contents of 141 Soviet technical journals, translations of the Russians' own abstract journal, *Referativny Zhurnal*, and a semi-monthly review of various areas of Soviet science compiled by the Central Intelligence Agency. The first gains in its collection programs, OTS expects eventually to process 50,000 abstracts and 10,000 complete translations a year from all sources including those of the U. S. Government. A list of OTS's current publications has been issued and may be obtained from OTS, Department of Commerce, Washington 25, D. C.

Promoters of better science information both in and out of government hope the NSF Service and OTS can coordinate the activity of a number of

agencies, public and governmental, to provide either translations of complete works or abstracts of them, together with information about where and how they can be obtained.

Commerce Calls 1959 Rubber Outlook Bright

Falling in line with cheery forecasts from industry economists, the Commerce Department predicts that 1959 will be a better-than-average year for the nation's rubber companies. There will be a few soft spots—synthetic rubber exports should fall 6% or 8% below 1958 levels, for example—but, on the whole, the Department's Business & Defense Services Administration, which did an industry-by-industry business forecast of the new year, has no hesitation in labeling rubber's prospects "bright."

No shortages of raw materials are expected during the year, Commerce feels. The optimistic reports from Detroit mean more tires for original equipment. More trucks and cars on the road at the same time mean higher replacement tire and equipment sales, although replacement equipment never did feel the pinch of the recession as did original equipment and industrial rubber products.

Increasing general industrial activity will require more hose, belting, packing, and sundry other industrial rubber goods, the Department believes. Hitched to this pick-up is an anticipated build-up of rubber product inventories.

New rubber consumption, the forecast continues, should increase from 10 to 12% over 1958, and synthetic rubber usage will grow from 11 to 13% as the ratio of synthetic to total new rubber consumption continues to increase. Production of synthetic should increase, though not so much as total consumption, by 8 to 10%.

INDUSTRY NEWS

RMA Expects 1958 To Be Fair Year; Estimates for 1959 Approach 1955 Highs

On the basis of the quickened pace of production in the fourth quarter of 1958, Ross R. Ormsby, president, The Rubber Manufacturers Association, Inc., said in his year-end report that the rubber goods manufacturing industry looks forward to a 13% gain in new rubber consumption in 1959 to 1,500,000 long tons as compared with the about 1,330,000 tons used in the year just ended. (A consumption of 1.5 million tons in 1959 could about equal the industry's all-time record of 1.53 million tons in 1955. Dollar value of products sales could be higher than in 1955.—Editor.)

Manufacturers of consumer-type rubber products generally did well in 1958, with estimated shipments of 59,500,000 replacement passenger-car tires setting a new record, for example, but other segments of the industry felt the impact of the 1957-58 business setback. Notably, these included firms manufacturing original equipment automotive rubber products and industrial rubber products. Ormsby said the industry's recovery since April, 1958, however, had been quite as rapid as the decline prior to that month. All segments of the industry were confronted with the problem of constantly increasing production costs in 1958, and there are no indications that this problem will ease in 1959.

In addition to the 5% increase in replacement passenger-car tire shipments in 1958 over 1957, it was estimated that shipments of replacement truck-bus tires would exceed 8½ million units in 1958, up 3% from the preceding year, and that shipments of replacement farm tires would show a gain of more than 14%. Shipments of rubber footwear should show a small gain over 1957 shipments, and those for major drug sundry items should come close to matching 1957 performance, it was added.

The substantial gains in the replacement tire field failed, however, to offset the impact of the decline in original equipment business, as reflected in Table 1.

No concern was expressed regarding the availability of new rubber in 1959 since producing capacity in the Free World was increased by more than 350,000 tons in 1958. Further planned expansions should increase the Free World's total new rubber producing capacity to more than 4,360,000 tons by 1962, which, it was estimated, would be about 580,000 tons in excess of projected annual requirements of rubber goods manufacturers throughout the world at that time. Most of this new capacity will be in the form of synthetic rubber producing facilities. In 1958, synthetic rubber accounted for 64% of total new rubber consumption in the United States and 25% elsewhere in the free world.

Table 2 gives the actual U. S. consumption figures for 1957 and the RMA's estimate for 1958 and 1959.

Mr. Ormsby pointed out that intensified research had added many new items to the list of more than 40,000 rubber products made by the non-tire segments of the rubber manufacturing industry. Sales of these non-tire products accounted for more than half of the industry's dollar volume in 1958. Notable among new and improved products, he said, were such items as hose, belting and packing, and seals

TABLE 1. AUTOMOTIVE AND FARM TIRE SHIPMENTS

	Passenger	Tire	Farm	Total
1957				
Original equipment	32,722,589	4,039,020	1,640,414	38,402,023
Replacement	56,612,267	8,549,295	1,545,048	66,706,610
Export	888,333	842,476	94,475	1,825,284
	90,223,189	13,430,791	3,279,937	106,933,917
1958				
Original equipment	22,300,000	3,345,000	1,715,000	27,360,000
Replacement	59,500,000	8,825,000	1,760,000	70,085,000
Export	700,000	630,000	100,000	1,430,000
	82,500,000	12,800,000	3,575,000	98,875,000

TABLE 2. U. S. RUBBER CONSUMPTION

(1,000 Long Tons)

Rubber	1957	1958	1959
Synthetic	926	854	975
Natural	539	476	525
Total New	1,465	1,330	1,500
Reclaimed	267	245	280

especially designed to meet the Space Age requirements of both industry and the military establishments for superior performance under extreme ranges in temperature.

NRB Calls Natural Outlook Very Good

For the natural rubber industry, it has been a good 1958, and the picture for 1959 and beyond looks equally good, according to H. C. Bugbee, president of the Natural Rubber Bureau, which is the spokesman in the United States for the natural rubber industry, and which released figures for 1958 and projected those for 1959.

It was estimated that the world will have consumed 1,950,000 long tons of natural rubber, as opposed to a production of 1,920,000 tons, in 1958; this the second year in the past five that there has been a deficit; the first was in 1956 when it was 15,000 tons. It is expected that world consumption will again exceed production by about 30,000 tons, with consumption at 1,970,000, and production at 1,940,000 tons.

Overall consumption in the United States at about 1,350,000 tons (480,000 natural), as compared with the 1,467,506 tons (520,000 natural), used in 1957, reflected the effect of our 1957-58 recession. A rise in natural rubber consumption in the U. S. of 8-10% in 1959 is considered likely by virtue of rises in truck and airplane tire production, heavy tire replacement business, and an overall rise in 1959 tire shipments of about 10%.

Looking beyond 1959, industry economists expect world consumption by 1965 to rise from 1958's approximately 3,175,000 tons to more than 4,000,000 tons. The natural rubber industry, particularly the Malayan producers, have concentrated heavily therefore on a replanting and new planting program, and by the end of 1958 it is estimated that 1,440,000, well over a third of that country's 3,500,000 rubber acres, will have been planted in high-yielding rubber (1,500 to 2,000 pounds per acre per year, as opposed to the approximately 490 pounds now collected).

Malaya's Minister for Commerce & Industry, Tan Siew Sin, has opened to *new* planting during the next 10 years some 1,000,000 hitherto untouched acres, and the Malayan Government has in the field mobile units explaining the advantages involved of both replanting and new planting to smallholders particularly.

The natural rubber industry is also in the midst of increasing its worldwide research and promotion effort. As of February, 1958, the Malayan growers increased by 50% the funds set aside for this purpose. The program for 1959 calls for broadly expanded activity, with research concentrated on projects that (1) would increase the yield per tree, and (2) would move natural rubber into use areas now unknown.

Keener Sees Rubber Well Ahead in 1959

The American rubber industry will bounce out of the 1958 dip and resume its long-term growth pattern through 1959, J. W. Keener, The B. F. Goodrich Co. president, said in his year-end statement.

Keener believes the rubber industry could well "run a little ahead" of the rest of the nation's economy in 1959. He based this statement upon the upturn in industrial rubber products, the rebuilding of still depleted customer inventories, substantially greater production of new automobiles, and continuing strength in replacement-tire sales.

Total tire shipments in 1959 are expected to be about 10% above last year's figure, which means sales of about 113 million tires of all types; more than half will be tubeless.

World rubber consumption in 1959 may set a new record of about 3,300,000 tons, excluding synthetic rubber consumed behind the Iron Curtain, the Goodrich president declared. Soviet bloc imports of natural rubber were estimated at 350,000 tons in 1958, about 20% more than the 1957 total.

World production of natural rubber in 1958 was estimated at 1,885,000 tons, about in line with consumption. Meanwhile, U. S. capacity for synthetic rubber production will increase to 1,700,000 tons by the end of 1959, an increase of more than 22% over the 1,372,000-ton capacity at the end of 1957. At the same time, new general-purpose synthetic rubber plants in England, West Germany, France, and Italy are expected to go into full production in 1959, adding further to world new rubber production capacity.

Goodrich announced in 1958 the organization of new companies for producing tires, tubes, plastics, and industrial rubber products in Brazil, Australia, and Iran; these plants will go into production in late 1959 or early 1960. A plant to produce special-purpose synthetic rubber and latices is under construction in Holland.

Robins Hopes for Good 1959 Sales and Profits

Non-tire rubber products manufacturers should enjoy good sales at home and abroad in 1959, according to Thomas Robins, Jr., chairman, Hewitt-Robins, Inc. There are approximately 1,000 companies who manufacture and sell non-tire rubber products in the United States, and it was estimated that they will consume about 560,000 long tons of rubber in 1959, 37% of the country's total rubber consumption.

The non-tire segment of the industry has been growing faster than the tire segment in recent years as a result of the development of many new products and the increased demand for standard products such as conveyor belting, foam rubber, industrial hose, rubber footwear, and floor covering. Although sales growth has been gratifying, the profit picture is disappointing, Robins declared. The intense competition for available business frequently drives selling prices to a point where it is impossible to make a fair return on investment, and the problem became particularly acute in the 1957-58 recession, he added. The hope was expressed that the improvement in economic conditions predicted for 1959 would be accompanied by an improvement in the industry's pricing policies.

Robins revealed that his company is building a conveyor system for bringing iron ore from a mine atop a 2,600-foot mountain down to a railroad in the valley below in a remote jungle area 225 miles southwest of Calcutta, India. The ore will be shipped to a new steel mill being erected as part of India's industrial modernization and expansion program. The belting for the conveyors will be more than four miles in length and will be manufactured in the Hewitt plant at Buffalo, N. Y.

Interchemical Corp. Opens Color Center

Interchemical Corp., a pioneer in the application of scientific color principles to the field of chemical coatings, has established a central headquarters for basic research, consultation, and information in the field of color, at the company's central research laboratories at 432 W. 45th St., New York, N. Y. Director of the center is F. L. Wurzburg, Jr., who has been associated with color for 25 years.

Basic research will be conducted on improved techniques for color matching and improved methods for establishing color standards and tolerances. Also, Interchemical's divisions and customers will be able to consult the center on basic color theory and its many industrial applications. Similar color information and assistance will be available to advertising agencies, industry associations, and other groups. A study of color nomenclature is a long-range objective of the center.

Among the special features of the center is a unique lighting system that can produce many of the kinds of illumination used in the appraisal of color. Its use with the center's precise colorimetric instruments will both facilitate research and help visitors understand some of the basic principles involved in the science of color.

Roebling Tire Bead Wire: Packaged for Maximum Benefit

The problems eliminated by this unique reel-less core packaging system are manifold. Loads are palletized two cores per pallet and may be stacked two or three high. This, plus the fact that you need not accumulate empty reels means storage space requirements are cut to *less than half*. You do away with all freight and handling costs on reels. the bother and expense of "bookkeeping" returnable reels, and the freezing of money in reel deposits.

This is typical of Roebling's advanced packaging methods—that makes handling Roebling high-quality wire so much easier. For details on this efficient Roebling Tire Bead Wire packaging method, or information on other types of Roebling wire, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities

Subsidiary of The Colorado Fuel and Iron Corporation

NOW... latex foam rubber *for less*

How a new "low-ammonia" latex cuts the high cost of compounding

An exclusive, new "low-ammonia" latex — imported from the Far East — now makes it possible for you to produce foam rubber for less, without sacrificing quality.

Pioneered, perfected, and patented by General Latex, this new product contains far less ammonia than ordinary latices, thanks to a newly developed co-preservative. Thus no ammonia removal is required before foaming — an entire compounding step is eliminated.

Unlike other "low-ammonia" latices, the new latex has analytical and processing characteristics similar to ordinary latex — does not interfere with the curing process and requires no change in the curing formulation. And it is completely interchangeable with high ammonia latex from which ammonia has been chemically or mechanically removed.

For full information on this cost-cutting development, write today.

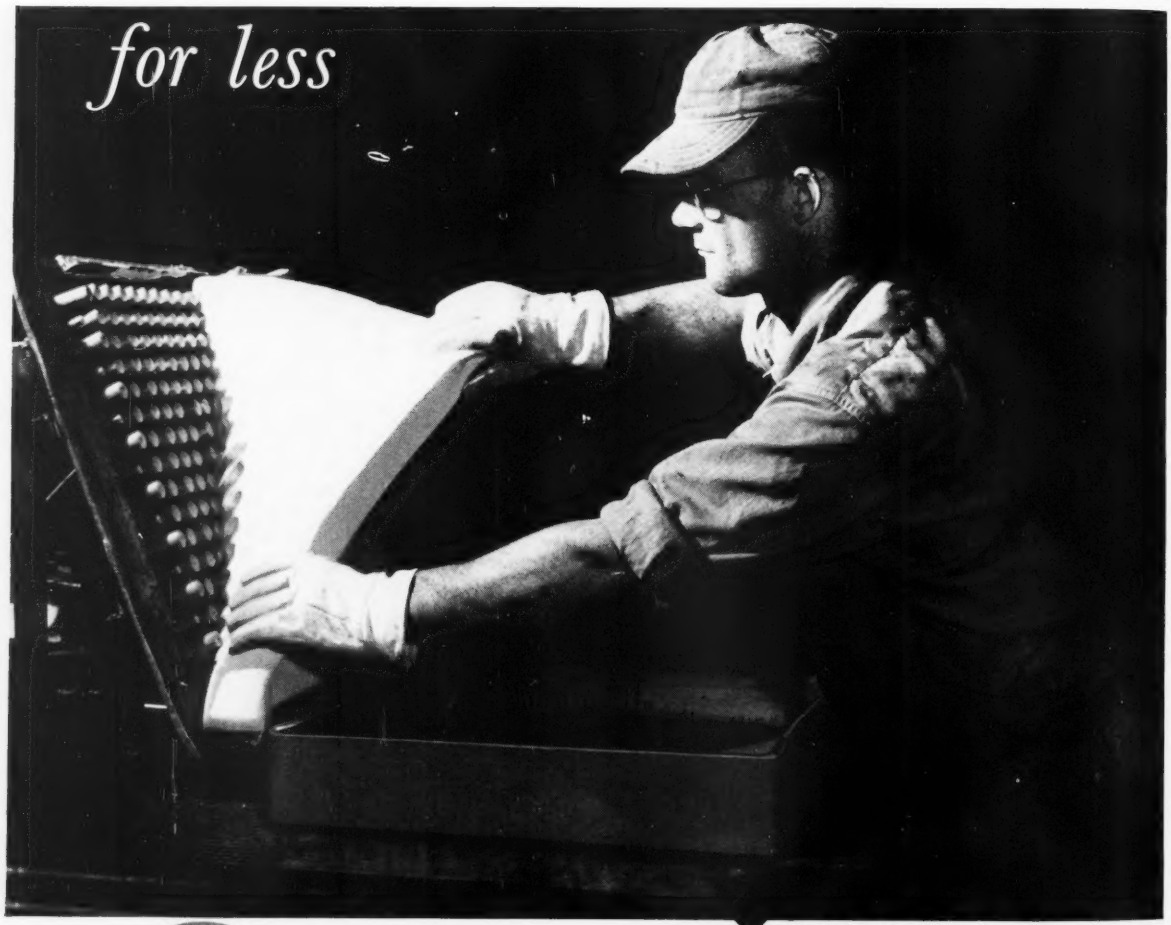


PHOTO COURTESY OF NUKRAFT MANUFACTURING CO., INC., SHELBYVILLE, INDIANA

GENERAL LATEX AND CHEMICAL CORPORATION

. . . 666 Main Street, Cambridge 39, Mass.

General Latex and Chemical Corporation (of Ohio) Ashland, Ohio
General Latex and Chemical Corporation (of Ga.) 1206 Lamar Street, Dalton, Georgia
General Latex & Chemicals (Canada) Ltd. 425 River Street, Verdun, Montreal, Canada
General Latex & Chemicals (Canada) Ltd. Brampton, Ontario, Canada

VULTEX

Latex importers and compounders.
Representatives in principal cities — exclusive agents for sale in U.S.A. of Harrisons & Crosfield Malayan Latex — sales agent in U.S.A. for Goodyear's PLIOLITE Latices

Akron Honors Litchfield for His Many Contributions to Industry and the World

Industrial, civic, local, and state government leaders met in the Sheraton Hotel in Akron, O. on December 15 to pay tribute to an unusual man, Paul Weeks Litchfield, honorary chairman of the Goodyear Tire & Rubber Co., and to laud him in his fifty-eighth year of service to the company for his contributions to it, the rubber industry, his community, and to the world.

At a testimonial dinner in the ballroom of the hotel, which had been arranged by the Akron Chamber of Commerce and a special Citizens' Committee, Litchfield was introduced by John S. Knight, publisher of Knight Newspapers, who called him the man who did the most to make Akron the rubber capital of the world. Further tribute was paid Litchfield by Harvey S. Firestone, Jr., chairman, Firestone Tire & Rubber Co.; William O'Neil, president and chairman, The General Tire & Rubber Co.; Arthur Kelley, executive vice president, The B. F. Goodrich Co.; H. E. Humphreys, Jr., chairman, United States Rubber Co.; J. P. Seiberling, president and chairman, Seiberling Rubber Co., and Charles Sauvain, vice president, Mohawk Rubber Co.

Another special part of the evening's program was the showing of a special motion picture depicting the life of Akron's world citizen. Associated with Goodyear for 58 of the company's 60 years, Litchfield was personally responsible for numerous innovations contributing to the growth of the company and the industry as a whole. When he joined Goodyear in 1900, the company employed 176 men. When he retired from full-time duty at the age of 83 and became honorary chairman in October, 1958, the company, under his leadership, had grown into a world-wide organization of 100,000 employees working in 29 plants in the United States and 22 plants and six rubber plantations in foreign countries.

E. J. Thomas, who succeeded Litchfield and board chairman of Goodyear, in his remarks at the dinner lauded his former boss for his philosophy that the important things were people and principles and for his ability to inspire loyalty and leadership in all with whom he came in contact.

Litchfield's principles for a sound business never varied, Thomas said. They embraced those which called for the greatest value to the consumer, the best wages and treatment to all employes, a fair return to the stockholder for the money he invested, leadership in your chosen fields of endeavor, the reward of merit in men, service to our country, and a living belief in God and the daily practice of His teachings, Thomas added.

He also announced that the Goodyear directorate had authorized the commissioning of one of America's fine sculptors to do a life-size bronze of Litchfield to be placed in the company's Akron headquarters.

Among the many and varied innovations fostered and directed by Litchfield and his associates were the rubber industry's first development department, the first pneumatic cord truck tire (demonstrated by the first cross-country trucking operation also conceived and directed by Litchfield), development of pneumatic tires for farm tractors, development of an efficient tire building machine, design of Goodyear's All-Weather tread, first pneumatic tire for airplanes, and the development of rubber plantations and cotton mills. Some other landmarks established during his 58 years on the Akron scene include the creation of a broad-gaged training program for Goodyear employes and organization of the famous Flying Squadron for training men for all jobs; employe welfare funds; programs of recreation and education and erection of Goodyear Hall as a "special dividend to employes"; and Industrial Assembly, a unique and successful organization of employe representation, which operated until the unionization of Goodyear employes in the year 1937.

Throughout his long career Litchfield has maintained a keen interest in aviation. It was mainly through his efforts that the Navy airships *Akron* and *Macon* were built, and during World War II he organized the Goodyear Aircraft Corp., which grew from almost nothing to one of the top 10 producers of aircraft.

His foresight in regard to synthetic rubber was an important contributing factor to establishment of the synthetic rubber industry in this country. A further tribute to his leadership was selection of his company by the government to operate the huge atomic energy plant near Portsmouth, O., a facility built at a cost of almost a billion dollars.

Litchfield pioneered in mass production and mass marketing, in labor relations and government relations. He established an export business which made the names of Akron and Goodyear known around the globe.

As dean of the rubber industry and guiding genius of many important developments in the industry, Paul Weeks Litchfield has written an indelible chapter in the histories of Akron and American industry.

Main speakers' table at testimonial dinner to P. W. Litchfield held in Akron on December 15. *Left to right:* William O'Neil, General Tire & Rubber Co.; L. Buckingham, Akron Chamber of Commerce; Harvey S. Firestone, Jr., Firestone Tire & Rubber; John S. Knight, Knight Newspapers; P. W. and Mrs. Litchfield; E. J. Thomas, Goodyear; and Arthur Kelly, B. F. Goodrich Co.

Shell Chemical's Four New Product Divisions

Shell Chemical Corp., New York, N. Y., has announced a company reorganization, effective January 1, involving the formation of four additional fully integrated divisions, bringing the total of these to five. Each division will be headed by a general manager and will engage in these lines of the company: agricultural chemicals, ammonia, industrial chemicals, plastics and resins, and synthetic rubber.

Under the new arrangement, the head office will be mainly concerned with matters involving the company as a whole. Four vice presidents will be engaged in this work. Present vice presidents are Leo V. Steck, Cecil W. Humphreys, and George R. Monkhouse. Since Steck has reached retirement age, two new vice presidents have been appointed: Bernard M. Downey, general manager of manufacturing operations, and George W. Huldrum, Jr., manager of the company's chemical sales division. Monkhouse, who was in charge of the ammonia division in Los Angeles, will be located in New York.

The new agricultural chemical division will be headed by Sumner H. McAllister. It will handle all functions pertaining to the products now sold by that division, including the plant at Denver, Colo.

The ammonia division, already an integrated operation, will be headed by Lawrence M. Roberts.

The new industrial chemicals division will be under Alfred W. Fleer. It will handle all functions related to the products formerly sold by the chemical sales divisions (excluding plastics and resins) including the plants at Houston, Tex., Norco, La., Dominguez, Calif., and Martinez, Calif., and the Houston research laboratory.

The new plastics and resins division will be headed by Martin Buck. It will handle the company's line of these materials and will functionally direct the operation of an appropriate portion of the Houston plant.

The new synthetic rubber division will be under John P. Cunningham. It will handle all functions related to the products sold by that division, including the plant and research laboratory at Torrance, Calif.

NYRC Buys New Plant

The 107-year-old New York Rubber Corp., one of the nation's oldest manufacturers of mechanical rubber goods, has purchased a new 70,000-square-foot plant in Swainsboro, Ga., which will be used for the fabrication of inflatable rubber life rafts and other inflatable rubber products. The company's headquarters and main plant are in Beacon, N. Y., where it has made conveyor belts and other industrial rubber goods since 1853.

The new plant, 350 feet long and 200 feet wide, was built in 1957. Considerable modification work will be done to the building to put it in shape for New York Rubber's manufacturing operations, including the installation of modern lighting and ventilating equipment. Initial employment in the new plant is estimated at 100 workers.

In 1853, New York Rubber Corp. made the first rubber conveyor belt ever produced in this country, curing it in the sun on the roof of its Beacon plant. In 1854 the company was licensed by Charles Goodyear to use his newly discovered vulcanizing process—the first American company to be granted this privilege.

During World II the company made many outstanding contributions to the war effort, including inflatable life jackets (Mae Wests) and inflatable life rafts for naval aviators. NYRC was the first to fabricate inflatable rubber pontoons for assault bridges for the Army's Corps of Engineers, and inflatable air mattresses for the Air Corps, making more of these mattresses than any other company, it is claimed.

Thiokol Now on NYSE

The Thiokol Chemical Corp., Bristol, Pa., pioneer producer of synthetic rubber and leading manufacturer of solid and liquid rocket propulsion systems, became listed on the New York Stock Exchange on December 10. It will be known on the trading floor by the symbol "THI." Attending the listing ceremony were: J. W. Crosby, president of Thiokol; S. M. Martin, Jr., vice president; J. C. Jorczak, vice president; and various directors.

The move was said to be indicative of recognition by investors that the missile industry is now one of the established industries, important in this nation's economy. To qualify for listing on the NYSE, Thiokol fulfilled a series of strict requirements. Of about 100 companies a year who seek listing, only 35 qualify.

Net sales of Thiokol for the first nine months of 1958 were $54,607,976, as compared to $39,026,522 for the similar period of 1957. Earnings per share for the first nine months increased to $1.38 in 1958, as compared to $1.09 in 1957.

With this listing on the NYSE, Thiokol joins some 1,100 corporations whose number of listed shares total 4.8 billion and are valued at about $200 billion. Over 8.6 million people own shares in all of the nation's publicly held companies.

Montecatini-Ziegler Claims on Polypropylene

Representatives of Germany's Karl Ziegler and Italy's Montecatini have issued a statement in an attempt to clarify the patent situation in connection with polyolefin polymers and catalysts used to make them. This step was taken as it has become increasingly pressing as more companies are producing polypropylene. The joint statement, issued by Montecatini, Societá Generale per l'Industria Mineraria e Chemica, Milano, Italy, and Karl Ziegler, director of the Max Planck-Institut-fuer Kohnlenforschung, Muelheim, Germany, follows:

"This joint statement released by Montecatini and Professor Ziegler is intended to complete the statement contained in a letter of the Head of the Planning and Development Division of Montecatini to the editor of *Rubber and Plastics Age*, published in the November, 1958, issue of said British magazine, as well as a similar statement announced on the occasion of the opening of the 8th National Plastics Exposition, Chicago, Ill., on November 16, 1958.

"According to an existing Montecatini-Ziegler agreement, Ziegler has exclusive rights on polypropylene in Germany and Montecatini has exclusive rights on polypropylene in Italy. Montecatini's and Ziegler's patent rights outside Italy and Germany are licensed by Montecatini according to said Montecatini-Ziegler agreement.

"Montecatini negotiates patent licenses taking into consideration Ziegler's wishes, final decisions being reserved to Montecatini, which retains the major share of the returns.

"This agreement was reached after the following developments had taken place: Montecatini became in January, 1953, one of the earliest licensees of Ziegler's pioneer developments on organometallic catalysts. Ziegler's 1953 invention of new complex organometallic catalysts and of the possibility of polymerizing ethylene to high polymers with the aid of them was disclosed to Montecatini in December, 1953. Shortly after this disclosure, Professor Natta, Montecatini's consultant, working with Ziegler-type catalysts, succeeded in discovering sterically differentiated polypropylenes and somewhat later he discovered stereospecific catalysts and invented his sterospecific propylene polymerization processes.

"Hercules [Powder Co.] and the four other U. S. companies which have acquired licenses from Ziegler prior to the Montecatini-Ziegler agreement (which licenses do not entail any rights on Montecatini's patent rights) have not yet acquired Montecatini's patent rights on polypropylene."

---

[1] *Chemical Week*, Nov. 29, 1958, p. 23.

Tracy Stresses Chemical Industry Competition

The remarks made by O. V. Tracy, vice president and director, Esso Standard Oil Co., and until recently president of Enjay Co., Inc., the Esso Standard subsidiary that produces and markets butyl rubber, before the semi-annual meeting of the Chemical Specialties Manufacturers Association in New York on December 9, are quite pertinent to the rubber and associated industries. Mr. Tracy's talk, which was entitled "The Challenge of Competition," forecast continued growth for "the nation's fastest-growing industry," that is, the chemical industry, and intensified competition—extending from the research laboratories to delivery improvements and better packaging.

The chemical industry is crowding the automotive industry for fourth place in sales in the nation's economy, Mr. Tracy said. Food, machinery, and oil are the only other industries besides the automobile manufacturers with annual sales volume exceeding the chemical industry's.

The recent recession taught the chemical and allied products industry the valuable lessons of the necessity to trim the costs of doing business, to intensify its sales effort, and that all kinds of competition are becoming a more potent force in its business, it was said.

Basically, in the chemical industry, there are two kinds of competition, that is, the competition among producers of the *same* products or commodities, and the competition that takes place *between* products. The fast pace of chemical research gives a company a competitive advantage on a new process or a new product for only a limited time before other companies in the field have developed another process to do the same job. Another reason for keen competition is that none of the existing producers of chemical has market dominance, and still another reason is the increase in foreign competition.

Mr. Tracy directed attention to the recent over-expansion in the chemical industry that has resulted in many facilities operating at less than capacity and therefore with higher unit costs. This problem of excess capacity is further aggravated by the growing chemical production capacity abroad, much of which seems to find its way to our domestic markets without difficulty and frequently at dismaying price levels.

Things are also changing in our markets for exports, and here Mr. Tracy cited the new facilities for the production of synthetic rubber that are being built abroad and resulting probable reduction in the market for American synthetic rubber.

The causes for the competition which takes place between old and new products, between different processes, or among chemical raw materials are found in the fast pace and high productivity of our industrial research. Good examples of product competition are the multi-cornered contest now going on in the packaging field among plastic films, wax paper, and metal foil; the "battle of the fibers"; and the competition in the paint industry between alkyd resins and rubber-based coatings. Even companies that produce quality products cannot be complacent about a continued assured market because, as Mr. Tracy put it:

"While you stop to pat yourself on the back, someone's sure to come out with a better product."

Prices and profit margins have already been squeezed, and Mr. Tracy foresaw no hope of early relief. To keep up with their competitors, companies will have to spend more money on research, sales effort, and customer service, but they must find economies in other places, he warned. In spite of this seemingly impossible challenge, Mr. Tracy said he was convinced that it is *not* too big to be met successfully by the members of America's most progressive and venturesome industry.

John P. Giunta

Giunta Joins RW

John P. Giunta has joined the staff of RUBBER WORLD as eastern sales representative. In this position he will assist Robert L. Miller, eastern sales manager, in serving RW's advertisers in the eastern area.

With a technical background, Mr. Giunta is well qualified to work with people to obtain the maximum effectiveness of advertising for the rubber industry.

A graduate of St. Peter's College in 1952 with a B.S. in chemistry, he joined the staff of Allied Chemical Corp., Hopewell, Va., and served as a chemist. He left Allied Chemical for two years to serve in the U. S. Navy. During this service Mr. Giunta performed duties in the clinical chemistry section. Following his tour in the Navy, he returned to Allied Chemical Corp., in the plastic and coal chemicals division and worked in the rubber research and application laboratory.

Mr. Giunta is a member of the American Chemical Society and the New York Rubber Group. During his off-hours he pursues hobbies of gardening and woodworking in his Bergenfield, N. J., home.

RMA Opposes Federal Highway Tax Increases

Ross R. Ormsby, president, The Rubber Manufacturers Association, Inc., in a statement on December 19 on behalf of its Tire Division, registered vigorous opposition to any of the tax increases that have been proposed to finance the expanded federal highway construction program.

Ormsby said there is increasing evidence that the Administration may ask for an increase in federal highway user taxes. Tire manufacturers were strong supporters of the Highway Act of 1956, even to the extent of backing a 60% increase in the federal excise tax for highway-type tires deemed necessary to the successful financing of the program. They also supported the imposition of a new tax on tread rubber used in retreading highway-type tires, he added. This Act created the Highway Trust Fund, into which all of the tax revenue derived from tires, inner tubes, and tread rubber was earmarked for highway expenditures. Of the several federal highway user taxes dedicated to the Highway Trust Fund, the revenues from these rubber products provide funds for highway construction second only to gasoline.

Prior to the approval of the 1956 Highway Act, all federal highway expenditures were appropriated from the General Fund. Under the Highway Trust Fund in the 1956 Act, highway users are now paying the total costs of the federal highway program despite the fact that the program contributes to the country's defense and permits improved postal service, to mention only two of its general welfare aspects, Ormsby pointed out.

"These same highway users also pay into the General Fund additional general and special taxes. The Tire Division of the RMA strongly favors an appropriation from the General Fund to provide the additional current revenue required for the completion of the Interstate and Defense Highway System, and to support the other Federal-aid highway programs," Ormsby said in conclusion.

New Johns-Manville Dutch Brand Plant

Johns-Manville Corp., New York, N. Y., put its seventh new factory in 1958 into production in Chicago, Ill., on November 12. It was one of eight new plants in the company's recent expansion program scheduled to be in operation during 1958, the company's 100th anniversary year. The new plant, located in south Chicago, is operated by the company's Dutch Brand division. It increases by more than 50% the J-M Dutch Brand division capacity for production of pressure-sensitive tapes, adhesives, and related rubber products

A. R. Fisher, chairman and president of Johns-Manville, and E. F. Boyle, vice president and general manager of the Dutch Brand division, other J-M officials, members of the press, and city officials attended the opening and a luncheon.

New Combining Machine

During the inspection of the new plant, J-M revealed a unique combining machine that has been several years in development. It is the first equipment of its type designed to laminate parallel strands of organic or synthetic materials on flexible sheets required in fabricating new and improved products for industry and homes.

Materials already successfully joined in various combinations on the equipment include glass fibers, paper, acetate, rayon, cellophane, nylon, asbestos paper, cotton, rubber, woven fabrics, building paper, Lurex, aluminum foil, copper, Mylar, vinyl, and polyethylene.

Reinforced Mylar sheets have been produced on the equipment for use as insulators and supports for mica splits used by industry. Metal foil, reinforced by parallel plastic strands and laminated to asbestos paper, has been fabricated as an exceptionally effective, strong, and dimensionally stable pipe wrap. Rubber sheeting, reinforced with parallel plastic strands, has been made experimentally as a protection for service entrance cables. Also, fire-retardant asbestos paper as thin as cigarette paper, and having unique dielectric properties, was laminated with parallel strands of glass fibers, 15 strands to the inch.

The new combining machine is automated electronically by push-button controls. It has 4,000 separate spools for parallel strand combining and is capable of being operated continuously without any down time for reloading. Each spool has a capacity ranging from 15,000 to 25,000 yards of yarn. The equipment is so new that it has not yet been given an official name, although the name "Dutch-Tex" is under consideration. J-M acquired rights to this important new technological development in July, 1958, from Hess Goldsmith Corp., a division of Burlington Mills.

The rest of the facilities at the new plant were described as the most modern in the United States for the fabrication of pressure-sensitive tapes, adhesives, and related rubber products. The new plant utilizes the latest mixing, coating, slitting, and combining equipment now available in the rubber and chemical industries in an electronic-controlled, automatic system of manufacture.

Dutch Brand History

Manufacture of Dutch Brand products was started in 1909 when Paul Van Cleef, a young chemist, hired a helper and began mixing rubber cement with some second-hand equipment. Three brothers joined him, forming Van Cleef Brothers, Inc., and new product lines were added, starting with friction tape. The company and the Dutch Brand line were acquired by Johns-Manville in 1947, becoming the Van Cleef division of Johns-Manville, and later the J-M Dutch Brand division.

At the time of this acquisition in December, 1947, the product line had expanded to include pressure-sensitive electrical tapes, rubber insulating tapes, cloth and paper industrial tapes, masking tapes, vinyl plastic electrical tapes, sponge rubber, cork and rubber composition, molded rubber products, and a greatly expanded line of rubber cements.

Dutch Brand Personnel

A strong team heads up research, development, and technical service activities of the J-M Dutch Brand division.

Carl E. Frick, technical manager for the division, is responsible for all technical matters at the Chicago laboratories and for division liaison with Dutch Brand scientific group at the J-M research and engineering centers at Manville, N. J., where fundamental and applied research on Dutch Brand products, processes, and equipment are located.

Dr. Frick has been associated with Dutch Brand products for nearly 35 years, having joined Van Cleef Bros., Inc., as chief chemist in 1923. He continued as plant manager of the Van Cleef firm when it was acquired by J-M in 1947. He was promoted to the newly created post of technical manager in 1958.

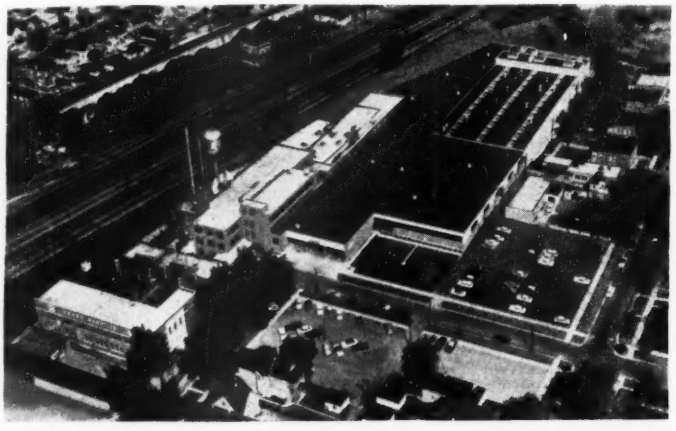
Earl F. Boyle is the general manager of the J-M Dutch Brand division, being responsible for the manufacturing and world-wide distribution of this line of industrial tapes, adhesives, sponge rubber, custom-molded rubber products, packings, sealings, and gasket materials.

C. Gregg Geiger is general sales manager for the division, having begun there in 1947 as a member in sales analysis and export sales. He was appointed merchandise manager in 1950 and was promoted to general sales manager on October 1, 1958.

Texus Creates Own Sales Organization

Effective January 1, 1959, Texas-U. S. Chemical Co.'s own sales force supplanted all the activities of its former domestic sales agent, Naugatuck Chemical Division of United States Rubber Co. Texas owns and operates a styrene-butadiene (SBR) plant and is joint owner of a butadiene plant in Port Neches, Tex. The chemical company is jointly owned by Texas Co. and U. S. Rubber, and its executive offices are in New York, N. Y.

The appointment of district sales managers to head up five domestic sales areas for Synpol SBR was announced in letters to the rubber industry by W. J. Burke, director of sales for Texus.



Air view of new J-M Dutch Brand plant

Form New Design Firm

The formation of Camden Associates, Inc., Salem, Mass., as an independent design consulting firm was recently announced by Robert H. Hurley, president. Associated with Hurley are Wallis E. Stuart, III, vice president, and David H. Donnan, treasurer.

Hurley was product design manager of The General Tire & Rubber Co.'s Bolta Products Division, Lawrence, Mass., for 5½ years. Stuart was formerly assistant product design manager. In these positions they have worked closely together in designing supported and unsupported vinyl upholstery, vinyl materials for automotive original equipment and automotive accessories, vinyl laminates for counter and table tops, wall and floor coverings, vinyl products for handbags, shoe linings, luggage and novelty usage, vinyl-to-metal materials for industrial applications, hotel and restaurant trays, and other plastic products.

Donnan has an extensive sales and management background, having been a product sales manager at Bolta from 1954 to August, 1958, during which time he specialized in the sales of saran monofilament yarns and original automotive equipment.

Camden Associates, Inc., planned its official grand opening on December 15. Headquarters are at 8 Irving St., Salem, Mass. The telephone number is Pioneer 5-0111.

New MIPlon Plastic

A new blended rigid plastic using Du Pont's Teflon has been developed by Modern Industrial Plastics, Inc., Dayton, O., and is marketed under the new trade mark, MIPlon. The new material is an improvement on, and supersedes the company's former compound, Rilon, a trade name being discontinued.

MIPlon makes use of inorganic additives to the fluorocarbon resin base to achieve improved physical characteristics. The blending of these various inorganic materials with Teflon introduced certain difficulties in processing the resultant material into completed parts. Modern Industrial Plastics has solved this problem; fabrication problems were greatly reduced, and a marked improvement in some of these physical properties was achieved. MIPlon, the company reports, exceeds pure Teflon by a factor up to 10 in resistance to deformation under load; resistance to wear is increased by as much as 500 times; and compressive strength and stiffness can be increased four to five times.

MIPlon is an improvement on earlier forms of filled Teflon in its ease of handling on the production line, and in the fact that the new additives, such as 15% glass in MIPlon 215, do not lower Teflon's desirable physical characteristics, such as lubricity and chemical inertness.

Application for MIPlon are in mechanical parts, bearings, seals, piston rings, and gaskets, etc., for electrical, automotive, aviation, and chemical applications. Additional information on MIPlon may be obtained from the company.

Roth Rubber's New Trimming Method

According to T. C. Argue, plant manager, Roth Rubber Co., Cicero, Ill., utilizing the smooth, slow die entry of hydraulic instead of mechanical presses on trimming operations of molded rubber products results in cleaner trims and consistent high quality of end-products, as far as this part of the manufacturing operation is concerned.

Roth Rubber uses a standard bench-model Multipress, eight-ton-capacity unit, built by Denison Engineering Division, American Brake Shoe Co., for this operation. Both the speed and the pressure of the ram stroke are easily set for any trimming need, and variations in both speed and pressure are easily accomplished during the run, should such changes be deemed advisable. With dual safety controls, maximum operator protection is assured on every rubber trimming job, and peak efficiency is assured with a minimum of operator training.

Mounting and setting of dies and feeding of molded components are done with a minimum of effort by virtue of ample daylight opening beneath the ram.

Hydraulic press method for trimming flash from molded rubber products at Roth Rubber Co.

Goodyear ZPG-3W Blimp

Second of the U. S. Navy's new class of non-rigid airships for Airborne Early Warning duty, the Goodyear ZPG-3W, is being flight tested by its builder, Goodyear Aircraft Corp., Akron, O. The blimp joins in test series a sister ship, flown for the first time in July. It marks the first time two airships of the same design have been in test status during the same period.

Both airships are undergoing extensive structural, aerodynamic, and electronic checkout programs. The prototype 3W, specially equipped for aerodynamic analysis, is scheduled for evaluation flights through June, 1959. Other than a checkout of the airship itself, the second 3W is being used for extensive testing of on-board electronic gear.

Although security regulations rule out disclosure of specific design details, the new ZPG-3W airships are the largest non-rigids ever built. Envelopes, which serve as natural radomes for large internally mounted radar antenna, have capacity of approximately 1½ million cubic feet, or about 50% greater than blimps currently in Navy service.

The new AEW airships have the same general appearance as the Goodyear ZPG-2W, a production Airborne Early Warning Model, and the ZPG, an Anti-Submarine Warfare version.

Power plants of the new ZPG-3W are two Wright 1820-88 engines mounted on outriggers extending from both sides of the control car. Twenty-one persons comprise the normal crew.

UCC Buys Amoco Plant

Union Carbide Corp., New York, N. Y., has exercised its option to purchase from Amoco Chemicals Corp. the utilizable facilities which remain on the 306-acre tract at Brownsville, Tex., site of the processing plant formerly operated by Amoco. The option also includes the 42-mile Weslaco-Brownsville natural gas pipeline. Union Carbide is negotiating a long-term lease with the Brownsville Navigation District (Port of Brownsville) for the Brownsville tract.

Utilization of these facilities will be deferred until additions and revisions have been made and also will depend upon completion of satisfactory arrangements for fuel gas and raw material supply. Operations at Brownsville will be carried on by Union Carbide Chemicals Co. and Union Carbide Olefins Co., both divisions of Union Carbide Corp. UCC is not contemplating the production of either synthetic gasoline or petroleum products; nor does it intend to produce chemicals by the Fischer-Tropsch process, as had been the case before the purchase.

Glidden To Sell West

The Glidden Co., Cleveland, O., has announced that its chemicals-pigments-metals division has established a revised method of distributing its products in the West Coast area. Effective January 1, it will channel all West Coast sales activities through its own offices there in order more adequately to serve the division's steadily expanding number of customers.

Ralph B. Quelos, eastern sales manager of the division, with headquarters in Baltimore, Md., will also manage sales for the West Coast area. William Ellis will represent the division in the San Francisco vicinity, and Fred Downer and M. Bonham will be responsible for the Los Angeles area.

Primary products of the division are titanium dioxide, lithopone, cadmium colors, metal powders, and copper oxides. Warehouses containing full inventories of these products will be maintained and controlled in both the Los Angeles and San Francisco Bay areas.

Potables in Sealdtanks

Successful test runs of Sealdtanks with plastic liners for trucking beverages and liquid foods have been announced by United States Rubber Co., New York, N. Y. The giant rubber containers are made in various sizes up to 4,000 gallons, and since they are collapsible, the shipper does not have to pay round-trip rate for one-way haul. Since their introduction by U. S. Rubber a year ago,[1] they have been purchased by companies to haul 24 different commodities.

Development of a polyethylene plastic liner by Visking Co., Chicago, Ill., a division of Union Carbide Corp., opened the way to safe shipment of potables. The liner in effect converts the interior of the Sealdtank into a polyethylene container, which can be reused many times.

Test runs on shipping milk have been watched by the dairy industry. The tests, conducted by Consolidated Freightways, Inc., with the cooperation of the Oregon State Department of Agriculture, have so far been successful. These tests indicate that shipping costs can be substantially lowered for dairy farmers. The tests also show that in the future a dairy farm can be located several hundred miles farther from its markets, where grazing land may be less expensive and feed more plentiful.

Sealdtanks with liners are also carrying liquid chocolate, liquid sugar, vinegar, and molasses. An oil company is planning to tow fresh water to its offshore drilling platforms in a Sealdtank.

A 30-foot Sealdtank is 56 inches in diameter when filled and weighs approximately 775 pounds empty. As with other sizes, it is made of four plies of rubber-coated rayon tire fabric molded similar to a tire. The outer coating is neoprene rubber for oil and weather resistance. Both ends are sealed by metal closures resembling spinal columns.

Owing to its flexible structure and design, it can absorb expansion and contraction of the lading without open venting. This eliminates danger from release of explosive and obnoxious vapors. Since the container collapses as it is being emptied, the lading does not come in contact with the air; thus oxidation and lading degradation are eliminated.

[1] RUBBER WORLD, Dec., 1957, p. 103.

ASTM Assigns New SBR Latex Number 2113

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials through Subcommittee 13 on Synthetic Elastomers has assigned a number to a styrene-butadiene latex (SBR), SBR 2113, requested by Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

TABLE 1. DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS—ASSIGNMENT OF NEW CODE NUMBER—ASTM D 1420-56T

Number as assigned	2113
Date assigned	12/8/58
Requested by	Naugatuck Chemical Division, United States Rubber Co.
Type	2113
Nominal temperature, °F.	43
Activator	FRA
Shortstop	ND
Catalyst	OHP
Emulsifier	mixed
Nominal conversion, %	80
Nominal Mooney viscosity, ML 1 + 4 (212° F.)—polymer	140
Nominal residual volatile, unsaturate, %	0.10
Nominal pH value	10.5
Bound styrene, %	44
Total solids, %	48

Note: Abbreviations and symbols are defined as follows: FRA = free radical type; ND = non-discoloring; OHP = organic hydroperoxide.

NEWS BRIEFS

Borden Chemical Co., Leominster, Mass., dedicated a $4-million addition to its polyvinyl chloride plant on December 10. The addition, started in November, 1957, has increased Borden's PVC production capacity at Leominster from 12 million to 38 million pounds per year. In addition to the manufacturing facilities, the company also enlarged its development laboratories, calling for a 100% increase in technical personnel.

Chamber of Commerce Export-Import Industries, New York, N. Y., is prepared greatly to assist business firms on a worldwide basis, as it is the world trade contract center for United States manufacturers seeking to have foreign companies to manufacture their products under licensing agreements. Likewise, the Chamber serves foreign manufacturers seeking to have U. S. manufacturers for the same purpose. It also assists U. S. and foreign firms interested in franchising affiliation arrangements for marketing their products in each other's respective countries.

Raybestos-Manhattan, Inc., Passaic, N. J., recently held a new type of regional and district managers' conference for formulating sales plans for 1959 and discussing how the company can improve service and products for its customers. This conference was held jointly by the Manahattan Rubber and Packing divisions and attended by members of production and engineering, sales and marketing executives, and officials. The regional and district managers from all parts of the country who also attended were indoctrinated with the plans and new information so that they in turn can conduct similar conferences in their districts to approximately 100 field representatives before January 1.

The Ajax Rubber Co. of Belgium has been granted exclusive rights to make Ripple Soles in Belgium for distribution in that country as well as in Holland and Luxembourg, according to Leonard Hack, president of Ripple Sole Corp., Detroit, Mich. This brings the number of Ripple Sole licensees to 8.

United States Rubber Co., New York, N. Y., has formed a four-man squad of specialists on tire retreading to give speedy field service to retreaders in need of quick advice or technical help. The strategically located experts are ready to help solve problems, demonstrate latest methods, materials, and equipment, advise on shop layout, answer technical questions, and show how to improve operating procedures, shop efficiency, and product quality. The men and their areas are: R. A. Bennett, who will cover the area west of Denver from his base in the company's Los Angeles plant; Floyd B. Fidler serving the Midwest from the Chicago branch; Hugh T. Chastain, covering the South from the Atlanta branch, and W. W. Edwards, who will handle New York and New England from the company's New York headquarters.

B. F. Goodrich Chemical Co., Cleveland, O., is supplying Geon resins which are being incorporated into a new material called Coustifab by the Mobile Plastics Division of the Cordo Chemical Corp. The new development consists of either cotton or fiber-glass fabric specially treated with a vinyl plastisol containing powdered lead. The result is an exceptionally flexible fabric with sufficient mass to absorb the low-frequency sounds which normal acoustical material cannot handle. Its suggested uses include sound dampers in jet airliners and in office business machines and wall covering in hospital X-ray rooms for radiation protection.

Latex Fiber Industries, Inc., Beaver Falls, N. Y., is discontinuing indefinitely pilot-plant operations on Airlex, a breathable plastic shoe insoling material bonded to a neoprene impregnated cellulose fiber sheet, which was introduced earlier this year. Pilot-plant operations were based upon batch processing which could not be considered for commercial scale production, the company stated. Future efforts will be concentrated on perfecting a cellulose neoprene combination to provide the same properties offered in the Airlex product.

Allied Chemical National Aniline Division, New York, N. Y., has reduced the price from $1.75 to $1.25 per pound on its Nacconate 300, a basic isocyanate used in making solid urethane rubber, elastomers, and coatings. Also, Nacconate 1300-50C, a solution of Nacconate 300, has been reduced from $1.00 to 86¢ per pound. Both reductions are effective immediately. Recent developments in urethane coating technology indicate an expanding market for Nacconate 300, Allied's trade name for diphenylmethane, 4,4′ di-isocyanate (MDI).

G. F. Oliver, *(center)* president, Oliver Tire & Rubber Co., Oakland, Calif., congratulates Stanley T. Johnson, company project engineer, on completion of plant construction and tread rubber production equipment installation at Flemington, N. J. C. C. Corkadel, chief tread rubber compounder looks on. The company specializes in the production of premium-quality tire tread rubber and original-equipment manufacturers' components.

Borden Chemical Co., New York, N. Y., has announced p'ans for construction of a polyvinyl alcohol plant designed to produce five million pounds per year and scheduled to go on stream in October, 1959. The new plant, being erected at a cost of $1.5 million, will adjoin the company's present polyvinyl alcohol plant at Leominster, Mass., where Borden also manufactures polyvinyl chloride, polyvinyl acetate beads and emulsions, and specialty monomers. A new continuous process will be employed in the new plant and not only will it assure the production of extremely high-quality polyvinyl alcohol, but it will also be versatile enough to produce all grades and viscosities on a continuous basis.

Standard Plastics Co., Breinigsville, Pa., is using urethane foam supplied by Isocyanate Products, Inc., to package (thus protecting) the sensitive recording instruments now being carried in the nose cone of Thor and Atlas missiles sent aloft to collect vital data. The sphere of foam, no larger than an oversized basketball, withstands impacts up to 45,000 times that caused by the force of gravity. It protects the equipment from vibration and shock from the launching to the time it is ejected and returned to earth. This cocoon of urethane consists of an outer shell of hard foam (20-pound density) containing a core of soft foam (six-pound density) in which are embedded the recording devices.

The B. F. Goodrich Tire Co., Akron, O., has announced that more than half the cars in America are rolling along the highways on tubeless tires, the company's development of a decade ago. Today, according to the company, with a backlog of experience in the tubeless field that antedates that of other manufacturers by more than three years, BFG is turning out two-thirds of its tire production without tubes. The tires became original equipment on 1955 models, and other tire manufacturers rushed to catch up, states BFG.

Dow Corning Corp., Midland, Mich., has announced price reductions ranging from 11 to 18% on Silastic LS-53, its fluorocarbon silicone rubber. The new prices, effective December 15, range from $18.00 per pound in 1,000-pound quantities to $24.00 per pound in less than 10-pound quantities. Silastic LS-53 is now available in unlimited quantities. Originally restricted for use only in essential military applications, the heat-stable, solvent-resistant rubber can now be used for any industrial or military design.

Precision Rubber Products Corp., Dayton, O., has developed a compound, Compound 18007, which, it claims, successfully resists attack and degradation by red fuming nitric acid. Severe testing procedure disclosed no evidence of flex cracking. This compound is extremely flexible, and volume increase is relatively low. Resistance to compression set is excellent. It is recommended for use in all rocket and missile applications which use RFNA and for use in applications where standard synthetic materials have failed.

Manufacturing Chemists' Association, Inc., has announced that it is moving its offices to the Universal Building, 1825 Connecticut Ave., N. W., Washington, D. C. The telephone number is HUdson 3-6126.

Thompson Aircraft Tire Corp. has moved its western retreading plant to 160 Beacon St., South San Francisco, Calif. The move will enable the company to offer more efficient service to its customers.

B. F. Goodrich Tire Co.'s Guy Gundaker, sales vice president, recently reported that the tire industry would sell about five million winter traction tires in 1958, an expected 25% increase over snow tire sales in 1957. The rise in sales of winter tires and the excellent year-round sales of regular tires in 1958 may boost total passenger-car replacement sales to 58 million this year, he added, topping last year's record sales by at least a million and a half units.

News Briefs

Whittaker, Clark & Daniels, Inc., recently relocated its New York office at 100 Church St., New York, N. Y. The move provides for modern office facilities in a new building—which have been expanded—and which will enable the company to offer improved customer service to the cosmetic, ceramic, paint, rubber and other industries to which Whittaker products are distributed.

Jefferson Chemical Co. Inc., Port Neches, Tex., has announced that a new ethylene plant went on stream early in December, the first of several units to be completed as part of a major expansion program. The new unit will triple the company's production capacity for ethylene, and the overall expansion will double its capacity for ethylene glycol, increase by 50% the production of ethylene oxide, and permit the company's entry into new fields based on ethylene and propylene. Later in the month, the second unit of the program, a direct oxidation plant for production of ethylene oxide, will be completed. Still later, a chlorine-caustic unit will be completed along with an ethylene glycol plant. Completing the expansion, in early summer, will be propylene glycol and propylene oxide units.

Precision Rubber Products Corp., has developed a new compound, 9078 D, for O-rings to be used with Skydol 500 and Skydol 7000. It is said also to give excellent service with any of the phosphate ester safety hydraulic fluids. Special characteristics are low compression set and resistance to swelling or deterioration. It is reported to give increased life under severe service conditions.

Minnesota Rubber Co., Minneapolis, Minn., has completed construction on a 30,000-square-foot new addition to its manufacturing facilities. The new building will house the engineering and tooling department in addition to providing space for additional rubber production. It was necessitated by an increased demand for the company's products, custom molded rubber parts and seals.

B. F. Goodrich Tire Co., Akron, O., as part of its Unified Contractor Program, is maintaining a daily inspection plan which is keeping more than 900 tires in service without delay to the rolling equipment at the Glen Canyon Dam project at the Colorado River in Arizona. The purpose is to forestall every chance of costly "down time" and to secure the longest possible service from every piece of equipment. All tires are inspected at least once a week, and tires on all large equipment are examined twice a day.

Borden Chemical Co. has started construction of a coatings and adhesives plant at Illiopolis, Ill. The plant is expected to be in production by July 1, 1959. The new half-million-dollar plant will serve the packaging, building, plastics, coatings, and adhesives industries in Chicago, St. Louis, Detroit, Kansas City, and other midwestern cities. It represents an expansion of current operations of Borden's coating and adhesive department at Peabody, Mass., where the department manufactures industrial coatings and finishes, adhesives, plastisols and hot melts, and at Middlesex, N. J., where the department manufactures flooring mastics, underlayment, flooring, asphalt emulsions, and other building material products. The Illiopolis site already has facilities for the manufacture of polyvinyl acetate emulsions, polyvinyl chloride, and styrene-butadiene emulsions.

Parker Seal Co., division of Parker-Hannifin Corp., Cleveland, O., is offering O-ring seals with characteristics needed in high-temperature hydraulic service as a result of development of Parker compound N-304-7. This material was formulated to meet stringent physical and functional requirements of military specification MIL-P-25732 (ASG). O-rings are molded in all standard sizes suitable for a temperature range of —65 to 275° F. For military usage, the seals are available in the MS28775 series in bonded stock packages.

Meisel Distributing Co., St. Louis, Mo., is marketing a new golf car designed by the Atwood Vacuum Machine Co., Rockford, Ill., and using the soft, cylindrical low-pressure Terra-Tires made by The Goodyear Tire & Rubber Co., Akron, O. The golf car, called the Atwood Terra-Car, rides on the Terra-Tires which conform with ground surfaces instead of resisting them. There is no damage to turf even when the Terra-Car is driven over very soft ground, even over soft, wet putting greens.

Hochman Plastics Machinery Corp., Newark, N. J., has announced its entry into the field of plastics, rubber, and hydraulic machinery, as suppliers of used, rebuilt, and new equipment. Herman M. Newman, named as president, has been active since 1931 as a specialist in plastics, rubber, and hydraulic equipment, both in rebuilding and redesigning used machines and in the design and construction of new equipment. Ralph Hochman, secretary-treasurer, has operated Ralph Hochman & Co., specializing in metal working equipment—used, rebuilt, and new. The principal office will be at 151 Mulberry St. and a spacious warehouse has been established at 79-81 Malvern St., both in Newark, N. J.

B. F. Goodrich's Flooring Division, Watertown, Mass., has announced that industry-wide sales of vinyl asbestos flooring have risen 106% since 1954, in contrast to a decrease of 15% for rubber tile sales in the same period; while asphalt floor tile gained less than 5%. Americans bought 350 million square feet of vinyl asbestos tile in 1958, a gain of about 16% over 1957 sales of 300 million square feet. A similar gain is expected in 1959. The rapid growth of vinyl asbestos tile use was attributed to its long life and low maintenance cost.

Hastings Aluminum Products, Inc., Hastings, Mich., has developed and is marketing a new type of house siding made of vinyl coated aluminum. The siding is coated with a special formulation made with Geon vinyl resin supplied by B. F. Goodrich Chemical Co. The enamel-like Geon coating, called Superclad, is by Sherwin-Williams Inc. It is said to have outstanding appearance and wear and weather resistance. The manufacture warrants the finish against blistering, cracking, or crazing for ten years.

Corduroy Rubber Co., Grand Rapids, Mich., has announced the development of a new distributor organization. In a test program started in November, 1957, Corduroy began setting up exclusive Corduroy distributors in certain areas of the country. The program met with enthusiastic response, and many new distributors have been added in the past year to handle the thousands of independent tire retailers. The company, manufacturer of replacement tires for passenger cars, is not interested in the original-equipment business.

Commercial Rubber Co., Los Angeles, Calif., has announced the completion of an additional 10,000 square feet of plant area, which will be used for finished products and raw material storage.

Rhodia Inc., New York, N. Y., informs that its recent investigations on the selection of products suitable for the correction of strong odors present in polyurethane foams has resulted in the creation of three new products for odor control. These products are Alamask RLT 482, RLT 483, and Alamask RLT 28. They are generally employed at concentrations of 0.03% or less and are added directly prior to the addition of the catalyst. All products are designed to withstand conditions of processing.

Bridgwater Machine Co.'s tire mold division has moved its Akron office to 2664 Gilchrist Rd., Akron 5, O. Telephone number is Republic 3-2201.

NEWS about PEOPLE

Hugh Burdette and **E. L. Green, Jr.**, have been elected to the board of directors of Godfrey L. Cabot, Inc., Boston, Mass. Burdette, who currently holds vice-president posts with Cabot Carbon Co., Cabot Shops, Inc., Cabot Engineering Co., and Cabot Gasoline Corp., is general manager of Cabot's southwestern division. Green, who has been with the Cabot industries since 1936, is vice president of both Cabot Carbon Co. and Cabot Gasoline Corp. and is general manager of the company's oil, gas, and gasoline department. Also, **Arthur H. Phillips** has been appointed to the position of clerk for the parent company. He has been associated with the company as an attorney since 1955 and was appointed general counsel and secretary in June, 1958.

M. George Brush has been named manager, automotive tire engineering, for The Firestone Tire & Rubber Co., Detroit, Mich. Appointed automotive engineers to serve under Brush on Firestone's Detroit technical staff are **William H. Corba** and **Richard W. Pantalone.** The appointments are part of a realignment of top personnel in the department, following the recent naming of **J. J. Robson** as its head.

William C. Franklin becomes assistant sales manager of Texas Butadiene & Chemical Corp., with offices in Houston, Tex. Before joining the company in a sales capacity in 1957, he had been with C. F. Braun & Co.

Raymond H. Blanchard, president of B. F. Goodrich Footwear & Flooring Co., Watertown, Mass., was elected "Boss of the Year" at the annual "Executives' Night" dinner-meeting of the Beacon Hill Chapter of the National Secretaries Association, on November 13, at Morse Auditorium, Museum of Science, Boston, Mass. The award is given by the Boston Chapter of the international organization in recognition of an executive's active interest in furthering the secretarial profession. Miss Kathryn Faulkner, secretary to Dr. Edwin L. Prien and a member of the local NSA chapter, presented the award to Blanchard. His secretary, Miss Mary Conroy, CPS, is an active member of the Beacon Hill Chapter and a past officer.

Charles H. Rybolt

J. C. Roberts

Charles H. Rybolt has been elected vice president, chemical divisions, Wallace & Tiernan, Inc., Belleville, N. J. He will be responsible for all operations of the company's chemical divisions which manufacture organic products, sebacic acid, plasticizers and fatty acids.

Roger G. Richards, sales manager of the plastics division, Diamond Alkali Co., Cleveland, O., has announced eight new appointments to its plastics division sales and service organizations. **Harry E. Connors** becomes product manager of Diamond paste resins. **Charles E. Henry** has been appointed sales representative for PVC resins in Ohio, Kentucky, western Indiana, and western Pennsylvania; while **Herbert C. Jardine** was made product manager to cover the southeastern states for Diamond's plastics division. **Phillip I. Johnson** has been assigned to cover the New York-Baltimore area as a PVC resin sales promotion representative, and **Alexander A. Jigger** will concentrate his attention on PVC resins as a sales representative in the New England States. **Raymond A. Chartier** and **Peter S. Weill** have been named technical service representatives on calendering and paste resins, respectively; while **James N. Jenkins** will now handle customer service problems involving extrusion of PVC resins.

J. C. Roberts has been appointed president of the Firestone Synthetic Rubber & Latex Co., Akron, O. Roberts, presently director of rubber purchases of the parent company, will continue in that post as well. He succeeds **Alvin D. Miller** as president of the synthetic division, who passed away on December 5. Roberts, who joined Firestone in 1924, has been engaged for more than 30 years in the buying and marketing of rubber. He became director of rubber purchases in 1940 and during World War II was loaned by Firestone to the Reconstruction Finance Corp. He was a member of the Rubber Reserve Co. and was one of the group which negotiated treaties with South American countries to promote the production of natural rubber in the Amazon River region.

Carl E. Barnes has been elected vice president-research for Minnesota Mining & Mfg. Co., St. Paul, Minn. Dr. Barnes will be responsible for all major research programs and policies; while **Lloyd A. Hatch,** vice president for new product development, will continue to coordinate commercialization programs for new products coming from 3M laboratories. Also, **John W. Copenhaver** has been named director of central research, the post formerly held by Dr. Barnes.

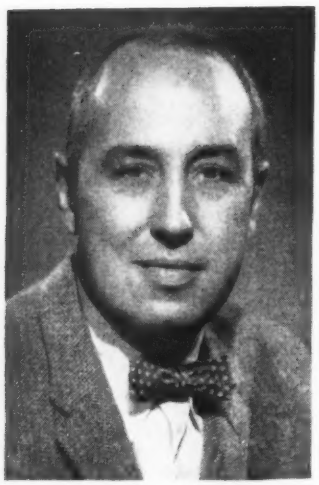
Edward C. Brown, Jr.

A. E. Brubaker

A. E. Brubaker has been made director of public relations of The Firestone Tire & Rubber Co., Akron, O. He leaves the post of retail advertising manager of Firestone to take over the new position. A veteran sales and advertising executive, he has been with the company 17 years.

John R. Nazy and **Ronald A. Thursack** recently joined the development department of Union Carbide Chemicals Co., division of Union Carbide Corp. at South Charleston, W. Va.

William C. Martin has been named manager of The General Tire & Rubber Co.'s Mogadore, O., chemical plant, and **Paul J. Earley** has been appointed production superintendent. **William R. George** has been transferred from his position as general foreman at General's Ashtabula, O., plant to the same post at Mogadore.



Robert D. Scott

Edward C. Brown Jr., special representative for the chemical division, The Goodyear Tire & Rubber Co., has been transferred to the division's Philadelphia, Pa., office. The assignment was made to supplement the division's activities throughout southeastern Pennsylvania, southern New Jersey, Delaware, Maryland, and Virginia. He will be concerned chiefly with sale of Plioflex synthetic rubbers and Pliovic plastic resins.

H. G. Taylor, founder and president, has been named chairman of the board of Precision Rubber Products Corp., Dayton, O. He is succeeded as president by **R. E. Allen,** vice president of all sales since 1949. **W. A. Smith** replaces Allen as vice president of the company. He formerly was vice president in charge of production and now will be vice president in charge of all operations.

William C. Martin

Robert D. Scott, vice president-manufacturing since May, 1955, has been named vice president-development of B. F. Goodrich Chemical Co., Cleveland, O. In his new capacity, Scott succeeds **Harry B. Warner,** recently appointed vice president-marketing of the company. Scott joined The B. F. Goodrich Co. as a chemist in the Akron, O., rubber laboratories in 1935. He was made general manager of plants for Goodrich Chemical in 1951 and was elevated to vice presidency in 1955.

Fred Case, formerly of Kirkhill, Inc., and **Percy Burdick,** previously with Triangle Tool & Machine Co., have joined with Gill Electric Mfg. Corp., Redlands, Calif., in the formation of the Gill-Case Corp., 630 W. 17th St., Costa Mesa, Calif. The firm will manufacture molds, tools, and special machines and do some rubber molding primarily for Gill Electric.

W. A. Smith

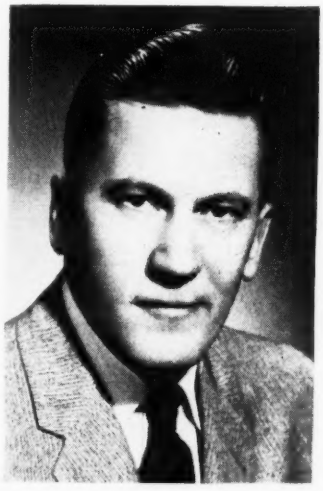
R. E. Allen

John S. Collbran, Jr., will serve as Pacific district manager, with headquarters at Los Angeles, Calif., for The New Jersey Zinc Co. He was formerly western district sales manager at Chicago, Ill. **James P. Sheridan,** since 1954 manager pigment sales, western district at Chicago, has been appointed western district manager. He has been with the company for more than 35 years and for the past 22 years has been a sales representative in the pigment field.

John S. Collbran, Jr.

James P. Sheridan

Eugene C. Medcalf has been named manager of the intermediates department, American Cyanamid Co., New York, N. Y. Medcalf, who assumed his post December 1, has overall responsibility for the marketing of all intermediate products of the company. He reports to **Hugh Puckett,** director of organic division sales. His office is in the department's headquarters at Bound Brook, N. J.



Oscar Niemi

Oscar Niemi becomes a technical service engineer for Marbon Chemical of Washington, W. Va., division of Borg-Warner. With Marbon he will assist customers in working out their injection molding problems. For the past 10 years he had been general superintendent in charge of the injection molding department of the Santay Corp.

E. H. Strobel has been appointed plant manager in the Des Moines, Iowa, plant of The Firestone Tire & Rubber Co.; while **James E. Trainer, Jr.,** succeeds him as production manager. Strobel, with Firestone 17 years, moves into the top post at the Iowa plant, succeeding **J. C. Blue,** who retires January 31 after having served in several executive capacities since he joined the company in 1916. Trainer has been with the Des Moines plant since 1955 and with Firestone for 10 years.

Nathan A. Beekley, Jr.

James E. Trainer, Jr.

E. H. Strobel

Nathan A. Beekley, Jr., former senior chemical engineer in the development department of The Goodyear Tire & Rubber Co.'s chemical division, has been appointed special representative in the division's New York district. In his new post, he will be concerned primarily with sale of Plioflex and Chemigum synthetic rubbers and Pliovic vinyl resins. The New York district covers lower New York State, northeastern Pennsylvania, and northern New Jersey.

Robert L. Richmond has been named general auditor for The B. F. Goodrich Co., Akron, O., to succeed **Roy C. Taylor,** who retired November 30. Richmond joined the company in 1952 as a senior internal auditor and, a year later, transferred to the corporate accounts department as senior corporate accountant. He became manager of federal tax accounting in 1956.

Leon L. Meyer has been named manager of retail development for The General Tire & Rubber Co., Akron, O. Previously with General's Los Angeles division, Meyer will now headquarter in Akron.

G. Thomas Parker has joined the staff of the Midwest office of Farrel-Birmingham Co., Inc., Chicago, Ill., effective November 1. He will assist in the sale of rubber and plastics machinery and other F-B products in several Midwest states. He has just completed a two-year course of in-company training in engineering and sales.

Harvey S. Firestone, Jr., chairman and chief executive officer of The Firestone Tire & Rubber Co., Akron, O., has accepted the invitation of Gen. Douglas MacArthur to serve on the U. S. Olympic Businessmen's Committee, of which the latter is chairman. The committee has been formed by MacArthur to lend endorsement to United States participation in the 1960 games.

Harold Hedden, sales representative, has retired after more than 48 years' service with The New Jersey Zinc Co., New York, N. Y. He started with the company as an office boy in 1910 and after positions in several departments became a salesman in the Pittsburgh office. He has been attached to the New York office for the past 30 years traveling the New York State and New England territories. Through a special arrangement, he will serve the company in the capacity of consultant in products promotion and customer relations in the southern Florida area.

Joel O. Hougen, A. E. Marshall and **Milton Welhoelter** have been appointed technologists in the research and engineering division, Monsanto Chemical Co., St. Louis, Mo. The appointment of technologists and scientists within the company's research and engineering groups is part of a program to acknowledge exceptional contributions of outstanding technical personnel in the achievement of the company's overall objectives.

M. Ernest Ionescu becomes manager of the newly formed special products department, industrial sales division, Nopco Chemical Co., Newark, N. J. The new department has been established to develop markets for the antioxidant, BHT (butylated hydroxy tolulene), used extensively in the petroleum industry.

Ken Champagne is now associated with Western Insulated Wire Co., Los Angeles, Calif., as a chemist.

Edward G. Ronsick

Edward G. Ronsick has been appointed to the Akron sales staff of the chemical division of The Goodyear Tire & Rubber Co., Akron, O. He joined the company in 1957 and worked in various capacities on its training squadron until his permanent assignment with the chemical division.

Mortimer H. Nickerson has joined Arthur D. Little, Inc., Cambridge, Mass., research, engineering, and management consultant, as a staff associate in the research and development division. Dr. Nickerson was, for 15 years, chief chemist for Debell & Richardson, Inc., consulting engineer specializing in plastics.

Wainwright Holt, Jr., has been appointed sales manager of centrifugal and axial compressors for Allis-Chalmers Mfg. Co., Milwaukee, Wis. He joined the company in 1951 and has been a representative for petroleum and chemical sales in the New York district since that time.

Louis K. Eilers has been named first vice president of the Tennessee Eastman Co. and the Texas Eastman Co., divisions of the Eastman Kodak Co., and president of Eastman Chemical Products, Inc., the company's marketing unit for products made by Tennessee Eastman and Texas Eastman. These divisions produce plastics and industrial chemicals, and the Tennessee division also produces synthetic fibers. Dr. Eilers succeeds **William S. Vaughn,** who has been elected vice president and general manager of Eastman Kodak Co., Rochester, N. Y.

L. J. Lien, formerly with the Rubberrite Corp., has joined the H. C. Lien Rubber Co., Los Angeles, Calif., as plant manager and an officer.

G. F. Blinzler has been advanced to western district manager in charge of Marlex sales at Pasadena, Calif., for Phillips Chemical Co.'s plastics sales division. He succeeds **R. G. Askew,** who has been promoted to export manager of Phillips plastics sales division, with headquarters in New York, N. Y.

Harry N. Lowell has joined the organic chemicals sales department, Dewey & Almy Chemical division, W. R. Grace & Co., Cambridge, Mass. He will assist **Charles E. Brookes,** sales manager, in special projects.

Robert C. Brooker has been named manager of passenger-tire engineering; **Kenneth L. Campbell, Jr.,** was made manager of truck and off-the-highway tire engineering, and **Robert S. Lee,** manager of passenger-tire construction in the tire engineering and development department, The Firestone Tire & Rubber Co., Akron, O. Brooker started with the company in 1947 as a college trainee and after holding various positions in the development department was made a senior passenger-tire engineer in 1954. Campbell came to Firestone in 1946 as a college trainee and became a senior engineer, truck tire engineering, in 1954; while Lee joined the company in 1950 as a project engineer and was made a senior engineer, passenger-tire engineering, in 1953.

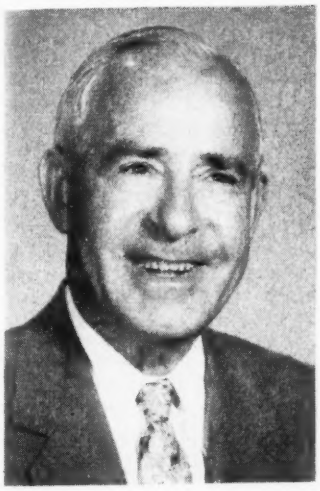
Russ Spachman has been appointed purchasing agent at L. A. Standard Rubber Co., Los Angeles, Calif. He has been with the company approximately four years, in the order department.

Marvin R. Paullus, St. Louis, Mo., has been elected president and chief executive officer of Leonard Construction Co., headquartering in Chicago, Ill. He replaces **C. F. Keife,** who resigned as president, but who will remain with the company in a consulting capacity. **R. A. Peters,** formerly construction manager with Leonard, was elected executive vice president. Leonard has been in the industrial and chemical plant construction field for more than 50 years and has engineered and constructed plants in many foreign countries as well as in the U. S.

Thomas V. Horrigan, assistant treasurer, United States Rubber Co., New York, N. Y., has been elected to membership in the Controllers Institute of America, a non-profit management organization of controllers and finance officers from all lines of business.

Frost Rubber Co. has moved to its new location at 2616 W. Grand Ave., Chicago 12, Ill. The phones are: Humboldt 9-4848-49.

News about People



Benton Studio

Isaac Drogin

Plaskon News Service

Bruce W. Carney

Norman A. Pierce has been named manager of corporate accounting for The B. F. Goodrich Co., Akron, O. Since 1953 he has been handling special assignments in the controller's office.

Harrison F. Rowbotham has joined B. B. Chemical Co., Cambridge, Mass., a subsidiary of United Shoe Machinery Corp., as manager of its Bostick department and will be responsible for marketing its expanding line of Bostik industrial adhesives. He was formerly associated with Angier Products, Inc., as vice president in charge of sales.

Henry E. Wieditz has been appointed sales representative for antiozonant products of Universal Oil Products Co., Des Plaines, Ill. Previously he had been doing research on antiozonant applications.

Bourdon Studios

Walter P. Hwozdek

Walter P. Hwozdek has been made development manager for National Polychemicals, Inc., Wilmington, Mass. He joined the firm's research and development staff in October, 1954.

E. J. Thomas, chairman of the board, The Goodyear Tire & Rubber Co., Akron, O., has been elected to membership on the board of trustees of the Committee for Economic Development, New York, N. Y.

E. Laurence Gay has been elected secretary-treasurer of Hewitt-Robins, Inc., Stamford, Conn. He was formerly with the law firm of Debevoise, Plimpton & McLean, New York, specializing in corporation finance work, and from 1952 to 1953 was a member of the legal staff of the United States High Commissioner to Germany.

Bruce W. Carney has been appointed assistant sales manager, chemical sales, plastics and coal chemicals division, Allied Chemical Corp., New York, N. Y. In his new position he will be primarily responsible for sales of tar acids and tar bases.

Isaac Drogin was unanimously elected a Fellow of the Institution of the Rubber Industry, London, England, during a meeting of its council on October 28. Associated with United Carbon Co. for the past 19 years, Dr. Drogin is vice president of two of the firm's subsidiaries—United Carbon Co., Inc., and United Rubber & Chemical Co. A member of a number of scientific and technical groups, he is the author of more than 20 publications dealing with carbon black and rubber technology.

Henry E. Wieditz

Pach Bros., N. Y.

E. Laurence Gay

Fabian Bachrach

Harrison F. Rowbotham

NEWS from ABROAD

France

SBR Plant Planned

France is to have her first factory for producing styrene-butadiene rubber (SBR). A group in which Shell-St. Gobain, Michelin, and Cabot-Texas Butadiene, a subsidiary of Godfrey L. Cabot, Inc., are interested, is to build a factory with capacity of 50,000 tons annually at Berre, near Marseilles, not far from the Shell-St. Gobain chemical plant and the Cabot carbon black factory. The SBR plant, expected to begin operating in 1961, will obtain feedstocks from the Shell-Berre refinery.

According to a recent report, the important French rubber companies, Michelin and Bergougnan, are preparing for the European Common market by an agreement for technical cooperation in which each of the firms will retain full autonomy.

Ni Compounds Useful Against Light and O_3

Investigations on the protection of vulcanized rubber against light and ozone by organic nickel compounds, carried out at the Institut Francais du Caoutchouc as part of a large research program, are reported in two recent articles in *Revue Générale du Caoutchouc*. In one,[1] P. Karmitz describes tests carried out on 36 organic nickel compounds to determine which chemical functions linked to nickel gave the best protection.

Exposure of light-colored and carbon black vulcanizates of different composition, to natural and artificial atmospheric action under static and dynamic conditions, revealed the unusual efficiency of the nickel xanthates, superior to that of the dithiocarbamates and without their defects. The best of all was found to be nickel isopropyl xanthate, which not only provides protection against net-like cracks (crazing), but also against oriented cracks; and the effect is enhanced by association with DPPD (diphenyl-p-phenylene diamine) and, under certain conditions, together with substances such as Heliozone (petroleum waxes), which promote migration of the protective agent to the surface.

Results of examinations of absorption spectra were inconclusive; yet it is suggested that the protective effect of certain organic nickel compounds may in part be related to their power to absorb radiations in the zone between 3.150 and 3.350 Å, considered to be particularly harmful to rubber. It is also suggested that there may be a relation between the "accelerative" structure of organic nickel compounds and their protective effect, and that the latter may be comparable to the deactivation phenomenon.

The use of nickel xanthates is covered by French patent No. 715,566 (1956) in the names of P. Karmits and C. Pinazzi.

The Action of KPNi

In the other article,[2] Miss M. Boucher, of the I.F.C., presents results of investigations conducted by G. M. Tesquet, a research worker with the well-known chemical concern, Etablissements Kuhlmann, up to the time of his sudden death.

This paper discusses detailed examinations of the action of nickel isopropyl xanthate (marketed as KPNi by Kuhlmann) as accelerator and anti-ager in natural and synthetic rubbers, as compared with other well-known protective agents including Ionol,[3] 2246,[4] UOP 88,[5] Santoflex AW,[6] MTBZ,[7] or mixtures of these products.

The tests indicate that KPNi appears to be a more versatile protective agent than most commercial products. As anti-ager, it gives good protection against harmful effects of light and ozone; it retards the appearance of net-like cracks (crazing), particularly in light mixes that are not heavily loaded and contain thiuram without sulfur. It is not so effective in this respect as the phenols, but the latter offer no protection against ozone cracking; whereas KPNi is almost as effective here as the paraphenylene diamines, which, however, cannot be used in light mixes.

As accelerator, KPNi is found to have no effect on rate of cure of compounds containing tetramethyl thiuram disulfide with little or no sulfur. But in compounds containing at least 2% sulfur it is a powerful accelerator; it helps to improve mechanical properties; high modulus vulcanizates are obtained. Scorch time, however, is often considerably increased, but this condition can be remedied by the addition of a good retarding agent.

Under certain conditions KPNi improves heat resistance of carbon black compounds, but it has no such effect on heat behavior of light compounds.

Tackiness Eliminated

The tackiness that develops in vulcanized rubber during aging, and measures for preventing it, were the subjects of research conducted at the Institut Français de Caoutchouc, by J. C. Danjard, L. Toullec, and A. Langlade.[1]

In the laboratory, tackiness could be reproduced on vulcanizates accelerated with guanidines and subjected to aging in confined atmosphere at 80° C. Among the various tests carried out to detect tackiness and evaluate it quantitatively, the determination of maximum swelling values proved the most useful. Results of these tests on vulcanizates accelerated with guanidines, mercaptobenzothiazole (MBT), MBT + DPG, and tetramethyl thiuram disulfide (TMTD) revealed relatively high increase in the maximum swelling value in the case of tacky vulcanizates alone; whereas the swelling values of the other vulcanizates remained constant or even decreased in the course of aging; furthermore, the only vulcanizates that became tacky were those accelerated with guanidines.

The possibilities offered for detecting tackiness by means of stress relaxation measurements were also mentioned. Determinations carried out with a specially designed device revealed marked relaxation in vulcanizates capable of becoming tacky on aging, as compared with those less susceptible or perfectly resistant to tackiness. From which it is concluded that the initial structure of a given vulcanizate, which depends largely on the kind of vulcanizing system used, is the main factor in the development of this phenomenon.

A number of antioxidants were then experimented with to determine their efficiency in preventing tackiness, as a result of which a three-part formula could be worked out, by using which, it is claimed, tackiness can be almost entirely inhibited even under severe

[1] July, 1958, p. 913.
[2] *Ibid.*, p. 904.
[3] Di-tert. butyl-4-methylphenol, Shell Chemical Co., New York, N. Y.
[4] Antioxidant 2246, 2,2-methylene-bis-(4-methyl-6-tert. butylphenol), American Cyanamid Co., Bound Brook, N. J.
[5] N,N' dioctyl-p-phenylene diamine, Universal Oil Products Co., Des Plaines, Ill.
[6] 6-Ethoxy-1,2-dihydro-2,2,4-trimethylquinoline, Monsanto Chemical Co., rubber chemicals department, Akron, O.
[7] Zinc mercaptobenzimidazolate.

[1] *Rev. gén. caoutchouc*, Mar., 1958, p. 305.

Profits leak out when you use loose carbon black! Now you can forget about putting carbon black in your rubber recipes. Goodrich-Gulf has already mixed it for you, in new Ameripol Micro-Black masterbatch. What's more, the black is thoroughly dispersed for superior batch uniformity.

Use Ameripol Micro-Black in your plant and eliminate the costly tasks of storing, moving and weighing of loose carbon black. *Package handling* costs are also eliminated because Micro-Black is shipped bareback.

Mixing time is greatly reduced—Micro-Black can increase your Banbury output 25% or more—or you can free a Banbury for other production.

Your finished products will have greater abrasion resistance when you make them with Micro-Black. For Goodrich-Gulf has achieved the ultimate in carbon black dispersal with "high liquid shear agitation" at the latex stage. For more information, write or call Goodrich-Gulf Chemicals, Inc., 3121 Euclid Avenue, Cleveland 15, Ohio, phone HEnderson 2-1000.

Goodrich-Gulf Chemicals, Inc.

Stop this waste . . .
switch to new
AMERIPOL MICRO-BLACK

the most finely dispersed carbon black masterbatch

conditions. The formula is: mercaptobenzimidazolate of zinc (MBTZ), 1%; phenyl-cyclohexyl-p-phenylenediamine (4010), 0.5%; 2,6-di-*tert*-butyl 4-methylphenol (Ionol),[2] 0.5%.

The Ionol may be replaced by an equal amount of 2,2-dihydroxy 1,1-dinaphthylmethane (M2B, of the Saint Denis concern of Paris, France).

[2] Shell Chemical Corp., New York 17, N. Y.

Nitrile-Vinyl Blend; New Osmometer

Parozo NS-1 (Paracril Ozo[1]) is a new Paracril BJ LT-type of acrylonitrile rubber, with low Mooney viscosity; it is modified with vinyl chloride. Produced by Etablissements Chevassus, Paris, (distributor for Naugatuck Chemical Division United States Rubber Co., in France) in the form of thin sheets, the new material is to be considered as a normal elastomer to which fillers can be added, also plasticizers if required, as well as curing agents and antioxidants.

Recently described[2] was a two-chamber osmometer having glass membranes, developed by the Institute for Chemical Technology Department of the Munich Technological Institute, in collaboration with Corning Glass Works, Corning, N. Y., U.S.A. The membranes, of Vicor glass, containing about 95% SiO_2, has pores about 30-40 Angstroms in diameter, and permeability to solvents is approximately on the same level as that of Cellophane 600. The advantages of using glass membranes are that they allow measurements of concentrated acids and measurements at temperatures up to 300° C., and with overpressure. Satisfactory values are obtainable for molecular weights above 3,000.

[1] RUBBER WORLD, Feb., 1958 p. 754.
[2] *Rev. gén. caoutchouc,* Aug.-Sept., 1958, p. 1073.

Malaya

Small Estate Interest In Replanting Lags

While government-aided replanting by smallholders has frequently figured in the news, and the local press is giving full coverage to the recently launched government campaign to stir up laggard smallholders, practically nothing has been published about the position of replanting on small estates. In Malaya rubber plantings of under 100 acres are classified as smallholdings; anything over 100 acres in extent comes under the head of estates.

An official report on the rubber planting scheme for the year ended December 31, 1957, reveals a marked lack of success with a hard core of owners of small estates, for the most part Asians. It is shown that 895 estates with a combined area of 217,445 acres, out of 2,478 estates covering 2,018,135 acres, had failed to participate in the replanting scheme. Yet one of the aims of the scheme was to reach precisely this group which in general is so much behind others in replanting.

It is now proposed to distribute among the reluctant small estates notices printed in English, Malay, Tamil, and Chinese, pointing out the advantages of replanting under the government scheme, according to which they are entitled to assistance in replanting up to 45,663 acres.

Superior Processing Patent Granted

The complete patent specification for producing Superior Processing rubber, submitted by the Rubber Research Institute, has been accepted by the British Patent Office, and has the number 803,013; it was opened to public inspection on October 15, 1958.

Production of the three varieties of this rubber now on the market: SP RSS, SP ADS, and SP pale crepe, is at the rate of 200 tons a month, and demand is increasing. So far the estates concerned in its production are: Sepang, Prang Besar, and Sungei Mahang (agents: Harrison & Crosfields, Ltd.), East Asiatic Co. Factory, Taiping, and Alma Estate (Plantation Agencies, Ltd).

The process is simple to operate, but a formal license from the board of the Rubber Research Institute is required, under the conditions of which the rubbers are, for the present at any rate, sold not according to international grades, but only as SP RSS, SP ADS, and SP pale crepe.

A new grade, SP brown crepe, is now being developed by the RRI; it is made from scrap rubber by a special process, for which patent has been applied for. The RRI has also been working on SP masterbatches which, when mixed dry with any type of rubber in suitable proportion, will confer SP characteristics on the blend. The material is now being evaluated in Malaya and Britain.

Estate Fragmentation

The plantation workers' unions are understandably worried over fragmentation of estates, since this always involved dismissal and dispersal of clerical staff as well as tappers and other workers directly connected with the gathering and preparation of latex. Recently a union leader, P. P. Narayanan, appealed to the government to appoint a "watch-dog committee" to study and prevent extensive fragmentation.

In reply, the Minister of Natural Resources, Inche Bahaman, stated that the Federation Government was keeping close watch on sales of estates so that action could be taken if sales and sub-division appeared to damage the national interests. At present the government has no legal powers to prevent free transfer of land and has therefore taken no step to prevent fragmentation. However, he added, so far the present system of reviewing sales was sufficient, and there was no need of a "watch-dog committee."

Fragmentation found a defender in the president of the North Malaya Asian Planters' Association, Soong Cheng Sung, who believes that the breaking up of estates into smaller units is by no means detrimental to the rubber planting industry or those connected with it; on the contrary, a considerable number of Malayans had thereby been enabled to acquire their own holdings, and these new owners now have a tangible stake in the country and would play their part in contributing to Malaya's economic stability.

Incidentally, Mr. Soong also took the opportunity to advise workers on the need of understanding and co-operation, especially in connection with employers' long-term projects and to urge smallholders to avail themselves of the replanting scheme.

Malaya's Changing Export Pattern

In view of the activity of Communist countries in the Singapore rubber market of late, it cannot come as a surprise to learn from official statistics that in the first ten months of 1958 their purchases came to 10% of Malaya's total exports for the period, against 6% of the total in the corresponding period of 1957. The extent of the increase is emphasized by the fact that total shipments from Malaya in the 1958 period, at 885,313 tons, were 9% above those for the corresponding 1957 months. In other words, the Communist countries as a whole must have nearly doubled their offtake in 1958. In October, 1958, Russia actually was Malaya's best rubber customer, ahead of America, Japan, and Britain.

The shift in relative importance of Malaya's export markets stands out more particularly when they are considered by continent. For then it appears that the share of Europe and

(Continued on page 600)

Made by the originators of custom-blended Sunoco gasolines . . .

Sunoco's "Custom-Made" Process Oils Ease Problems Of Quality Control

Sun Oil Company custom-refines *seventeen narrow-specification* Rubber Process Oils for the rubber industry. Each one is designed to fit a special need for product quality or economy.

THE TABLE ON THE RIGHT gives some facts about six of Sun's most widely used Rubber Oils. Others, not listed, include a series of paraffin oils with low aromatic content; naphthenic oils with moderate aromatic content; and Sundex oils with high aromatic content.

IF YOU PROCESS	USE	BECAUSE
Light-colored oil-extended polymers (1703, 1708, etc.)	**CIRCOSOL® NS**	It combines superior nonstaining characteristics with best processibility, imparts good physicals. Primarily an extender.
Oil-extended polymers (1703, 1708, etc.)	**CIRCOSOL 2XH**	It's a general-purpose softener and extender for light-colored rubber goods, especially where optimum physicals are required.
Regular neoprenes, natural rubber, Hypalon (where color is a problem)	**CIRCO® LIGHT**	It's an ideal all-around moderate-priced plasticizer for nonstaining reclaims and butyl inner tubes, SBR, GN, W, WRT.
Oil-extended polymers (1705, 1710, etc.) and natural rubber, Hypalon (where color is no problem)	**SUNDEX® 53**	It's a double-distilled aromatic plasticizer for tire-tread stock, rubber footwear, matting, toys, semi-hard rubbers, high-Mooney WHV.
Black master-batch polymers 1706, 1711, 1712, etc.	**SUNDEX 1585**	It's a new highly aromatic plasticizer for tough polymers where easy processing is desired. This is a distilled process aid.
Natural rubber, SBR polymers, regular and WHV neoprenes, acrylonitrile polymers	**SUNDEX 85**	It's especially recommended for very high loadings of WHV neoprene (from 75 to over 100 parts Sundex 85 to 100 parts polymer). Used in hard rubber goods.

- To help you select the correct oil for your individual needs Sun has just published a new brochure: "A GRAPHIC METHOD FOR SELECTING OILS USED IN COMPOUNDING AND EXTENDING BUTADIENE-STYRENE RUBBERS."

  Get a copy from your Sun man or write Dept. RW-1.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

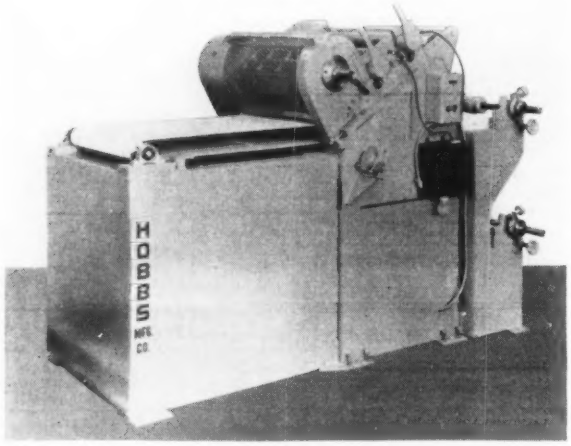
PHILADELPHIA 3, PA.

SUNOCO®

© 1958 SUN OIL COMPANY

IN CANADA: Sun Oil Company Limited, Toronto and Montreal • IN BRITAIN: British Sun Oil Company, Ltd., London W. C. 2. England • THE NETHERLANDS: Netherlands Sun Oil Company, Rotterdam C. The Netherlands • WESTERN EUROPE (except the Netherlands) • NEAR EAST, NORTH AFRICA: Sun Oil Company (Belgium) S.A., Antwerp, Belgium.

NEW EQUIPMENT



New rotary cutter

Hobbs Rotary Cutter

A new rotary cutter that can cut from rolls or in synchronization with in-process work has been announced by Hobbs Mfg. Co., Worcester, Mass., specialist in the manufacture of cutting equipment. This latest addition to the Hobbs line of cutters and slitters is available in widths from 24 to 60 inches.

Pieces from two inches to 60 inches long can be cut by the new machine, the company reports. Among other features rated desirable by converters, this cutter provides infinitely variable cutoff lengths, at speeds up to 50 cuts per minute. On this rotary cutter, cutoff length adjustment is accomplished by means of a single control knob with a micrometer adjustment. All electrical controls are standard components.

The machine can be equipped with razor-blade score cut or shear-cut slitting attachment for longitudinal cutting. The rotary knife has an angular adjustment to insure square cut.

The complete drive system consists of gears and timing belt for smooth, quiet, and efficient operation.

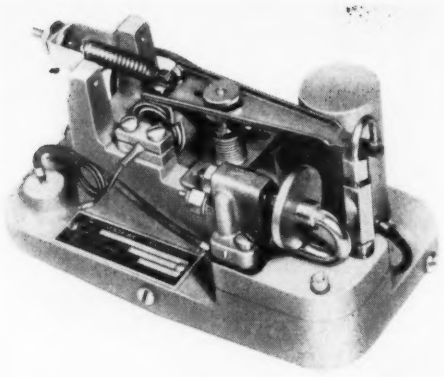
The rotary and stationary blades are manufactured of composite steel for maximum life, and each is fitted with adjustments to compensate for wear. The blades are easily removed for sharpening or eventual replacement.

Accessory equipment includes unwinding stands, run-out conveyors, and stockers. Price range without accessories is from $5,000 to $8,000, according to width of the unit. Full details, together with recommendations for specific installation, are available from the manufacturer.

Sensaire Temperature Transmitter

Taylor Instrument Cos., Rochester, N. Y., has announced its new Sensaire temperature transmitter for low-cost temperature measurement requirements in the —30 to +1200° F. range. Versatility and simplicity are offered in a unit having few moving parts, assuring longer effective service life.

A thumb-screw adjustment zero sets over a wide range. Further range limits and operational spans can be established as needed, right in the field. Only the substitution of a different precalibrated and fully compensated thermal system is required. No other changes are necessary, and no barometric effect is noted.



Taylor Sensaire temperature transmitter

The Sensaire transmitter is a sturdy compact unit, unaffected by normal plant vibration. It incorporates the smallest bulb presently available in a filled system with other time tested and proven components—the standard Fulscope type relay—where desired, the standard Speed-Act unit.

A universal-type mounting bracket permits installation almost anywhere: on flat surfaces, pipe lines, well wrench heads, on pipe hangers, or on separable bushings; and with various degrees of rotation.

Specifications, installation, and ordering data are presented in a technical bulletin available from the company.

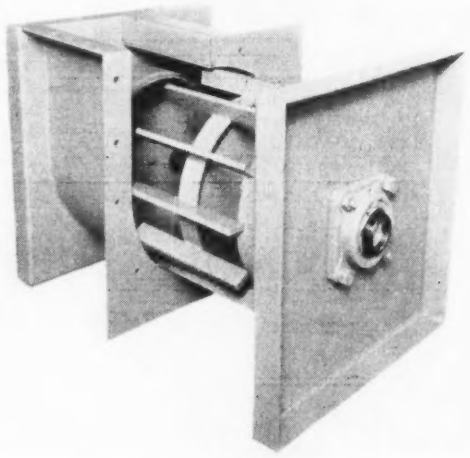
Rotary Paddle Feeder

Formulation inaccuracies resulting from pulsating material delivery are eliminated by a newly designed rotary paddle feeder which delivers a constant, uniform stream. Richardson Scale Co., Clifton, N. J., recently announced.

Operating principle of the new feeder is based on a series of paddles which revolve around a stable drum within a housing. This design is said to prevent pile-up of material and to provide a unique self-cleaning feature. Uninterrupted material flow is further assured by a regulating baffle at the discharge point.

As material is delivered practically vertically, this permits installation of equipment directly below bin opening, with no loss of floor space. The feeder was designed originally to handle pelletized carbon black, but applications for the new unit are

(*Continued on page 588*)



Richardson's new paddle feeder

THINKING OF

YOU!

FOR THE RUBBER INDUSTRY

National Polychemicals has just started the manufacture of phenolic resins for the rubber industry. We are entering this field primarily because we believe that much can be done technically to improve thermosetting resins for this area of application. We intend to specialize in your compounding problems. We expect to develop new and improved resins for the rubber industry. We welcome your thoughts and suggestions.

We now have two types of resins available. These are standard types. Poly-Phen S-201 is designed for use with general purpose, synthetic rubber and natural rubber. The other, Poly-Phen S-202, has application in the compounding of nitrile rubbers. The uncatalyzed resin is available in powder and flake form. Both S-201 and S-202 are also supplied admixed with catalyst. Technical literature and samples of these resins are now ready.

NATIONAL POLYCHEMICALS, INC.

Wilmington, Massachusetts

NEW MATERIALS

Dabco — Foam Catalyst

Dabco, a new one-shot polyether catalyst used for producing odorless urethane foam, has been developed by Houdry Process Corp., Philadelphia, Pa., a leading manufacturer of catalysts and chemicals for petroleum refining and chemical processing. Dabco, chemically known as triethylenediamine, not only foams one-shot polyether systems, but can also be used to produce foam from polyether prepolymers, dimer acid esters, adipic acid esters, and copolymers of dimers and polyethers and adipates and polyethers. It is also expected to have application in urethane coatings.

The catalyst is expected to supplant the costly, tedious prepolymer techniques now being used in most urethane foam manufacturing. It can be used to foam any or all commercial polyethers to produce flexible, rigid, or semi-rigid foams with a wide range of controlled properties, the manufacturer reports.

The new one-shot polyether catalyst is expected to improve economics of urethane foam production, while simplifying manufacturing procedures and eliminating problems of reproducibility, storage, and shelf life.

Flexible foams produced with Dabco are said to have low compression set, good properties of elongation, tensile, and tear and shear strength, and to exhibit excellent load-bearing characteristics.

A technical data sheet, giving a typical formulation for preparing a one-shot polyether foam with Dabco, is available from the manufacturer.

New Silastic RTV 502

A new room-temperature vulcanizing silicone rubber, called Silastic RTV 502, has been announced by Dow Corning Corp., Midland, Mich. It is an easy-to-apply liquid which cures to a rubber in only 30 minutes, or about 20 times faster than conventional RTV silicone rubbers.

RTV silicone rubbers have gained acceptance as versatile, basic engineering materials because they offer a fast, simple, low-cost method of obtaining rubber-like properties. Special features of Silastic RTV 502 include: it remains rubbery from —70 to 500° F.; has excellent insulating properties; resists weathering and moisture; withstands ozone; has good corona resistance; and it absorbs mechanical shock and vibration.

Silastic RTV 502 is suitable for patching, sealing, calking, potting, and making parts for models and prototypes. Its quick-setting feature may be especially useful in making impressions of objects; the impression can then be used as a mold to duplicate the original objects.

In use, Silastic RTV 502 is mixed with a catalyst, stannous octoate. When catalyzed in a prescribed manner, it vulcanizes to a tough, elastic solid in about 30 minutes.

Some typical properties of Silastic RTV 502 are (before catalyzing):

Viscosity, centistokes	50,000
Color	white
Specific gravity @ 77° F.	1.12

A technical data sheet, Silastic Facts 9-389, which gives more detailed information about this material may be had from Dow Corning.

New Flexzone 6-H

Flexzone 6-H, a versatile chemical which provides a high degree of protection against both ozone and flex cracking in rubber products, has been announced in a new technical bulletin, No. 220-A, by Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. Said to be also a strong antioxidant, being effective against both heat and oxygen, it is recommended for use in improving the age resistance, fatigue life, and especially the ozone cracking and weathering resistance of all types of rubber products. It is moreover, recommended in tire sidewalls, tire treads, camelback, insulated wire and cable, hose, footwear, and other rubber products. It is also a good anti-copper reagent.

Flexzone 6-H (N-phenyl-N'-cyclohexyl-p-phenylene-diamine) is an all-purpose antioxidant-antiozonant. It also protects the unvulcanized polymer from gel build-up and resinification during hot processing. This material, furthermore, is a strong protectant in both natural rubber and SBR polymers as well as in blends of these polymers. Recommendations as to the amount of Flexzone 6-H for each use depends on the polymer, compounding ingredients, service conditions, and degree of protection required. It is not recommended for use in products where staining and discoloration are factors.

Some typical physical properties of Flexzone 6-H follow:

Form	grey-violet powder (may darken upon exposure to light and air)
Specific gravity	1.29
Melting range	103-107° C.
Storage stability	good
Solubility	soluble in benzene, carbon tetrachloride, acetone, methylene chloride, ethyl alcohol; insoluble in water
Toxicity	no adverse physiological effects reported

SP-12 Phenolic Resin

A new heat-reactive phenolic resin which makes possible the production of nitrile rubber adhesives with excellent tack, high tensile strength, and high thermal softening point has been announced by Schenectady Resin Division, Schenectady Varnish Co., Inc., Schenectady, N. Y. Designated SP-12, the new resin is an oil soluble, crushed phenolic, characterized by extremely fast cure. It is reported to be completely compatible with nitrile rubber and soluble in aromatic or aliphatic solvents.

A significant improvement in the tensile strength of an adhesive can be made by milling SP-12 resin with the nitrile rubber before cutting with a solvent. Nitrile adhesives made with the resin are said to have good color fastness—an important factor in adhesives used to bond ladies' modern footwear.

Uses for SP-12 resin include pressure-sensitive, cold-setting and heat-setting nitrile adhesives for a variety of industrial applications. Good bonds with most porous materials and fair bonds to metal are possible with these adhesives.

Some typical physical properties of SP-12 resin follow:

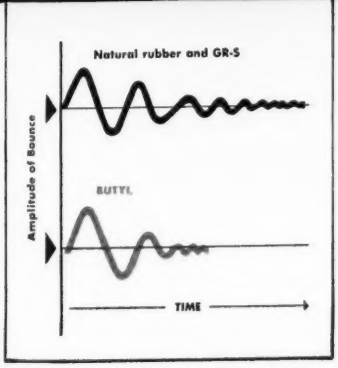
Specific gravity	1.06–1.16
Melting point	150–165° F.
Color, U.S.D.A. Rosin Std's	X or lighter

SP-12 resin, according to the manufacturer, was developed as a companion resin to SP-126, a recently announced heat-resistant, phenolic resin for neoprene adhesives.

Fura-Tone NC 1012

Fura-Tone NC 1012, a low-viscosity liquid furfural-derived additive which functions as an extremely efficient antiozonant in neoprene and butyl rubber compounds, is now available from the Irvington chemical division, Minnesota Mining & Mfg. Co., Newark, N. J.

Maximum ozone resistance of compounds of neoprene and butyl containing this material appears to depend on the presence of a threshold amount of this antiozonant in the compound. On the basis of laboratory testing, this threshold amount has



Butyl's superior shock absorption characteristics reduce amplitude of bounce in much less time as compared with other rubbers.

Enjay Butyl, because of its higher damping factor, absorbs shock energy *more* completely than any other rubber. Through simple variations in compounding or processing, you can build the right degree of resiliency for your requirements. Butyl is the ideal rubber for motor mounts, load cushions, sound deadener insulation, axle and body bumpers—and other shock, noise and mechanical vibration applications.

Butyl *also* offers outstanding resistance to weathering and sunlight . . . chemicals . . . heat . . . abrasion, tear and flexing . . . unmatched electrical properties and impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

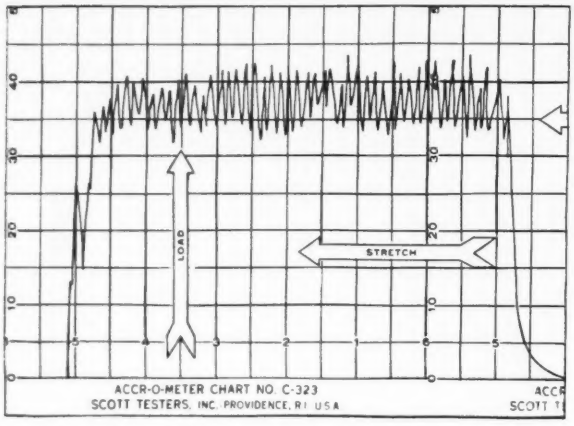
ENJAY® BUTYL

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

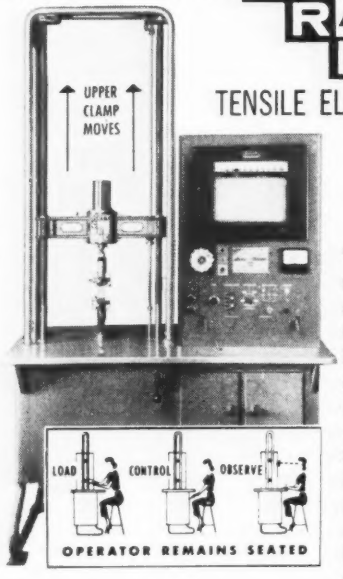
Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

HERE'S **TRUE** REGISTRATION OF AN ADHESION TEST (ASTM D-413)



DEMONSTRATING THE SENSITIVITY OF THE ELECTRIC WEIGHING SYSTEM IN THE

BRAND NEW SCOTT **CONSTANT RATE-OF EXTENSION** TENSILE ELONGATION TESTER



The registration of this adhesion test indicates a series of tears (release of bond) and demonstrates the response of the electric weighing system of the Scott CRE tester for this test, as well as for any test having a rapidly fluctuating load. Incidentally, this same tester may also be used in tests of tear, tensile, shear, compression, etc. of any material requiring loads of less than 1,000 lbs., and with up to 400:1 magnification of chart recording.

AMAZINGLY LOW COST

Request new "CRE Bulletin"

SCOTT TESTERS, INC.
90 Blackstone St., Providence, R. I.

Representatives in Foreign Countries

New Symbol of Scott World-Standard Testing

New Materials

been established as being between 1.5 to two parts Fura-Tone NC 1012 per 100 parts of rubber hydrocarbon for neoprene and about five parts for butyl rubbers. Since variations in formulation and compounding have an effect on the ozone resistance of a formulation, it is recommended that a minimum addition of two to three parts of NC 1012 per 100 parts rubber hydrocarbon be used to obtain optimum results for neoprene compounds and five parts for butyl compounds.

Some typical physical properties of Fura-Tone NC 1012 follow:

Viscosity	20–50 cps. @ 25° C.
Color	brown
Odor	mild aromatic
Specific gravity	1.110 @ 25° C.
Boiling point (initial)	210° C. @ 760 mm.
Flash point	93° C.

Formulations of this material with butyl and neoprene compounds, and vulcanizate data are presented in a technical data sheet available from the company.

Solfast Blue G 43100

A new green shade, stable phthalocyanine blue, called Solfast Blue G 43100, recently was developed by the pigment, color, and chemical division of Sherwin-Williams Co., New York, N. Y. It is reported to have an exceptionally jet masstone and bright green undertone. From deep shades to delicate pastels, the brightness of 43100 is useful as a primary pigment or mixed with yellows to make cleaner greens. This new pigment may be dispersed to its ultimate desirable characteristics with a minimum of grinding.

The outstanding heat and light resistance and non-bleeding properties of the phthalocyanines, plus the desirable shade of 43100, make it attractive for use in rubber.

Some typical physical properties of Solfast Blue G 43100 follow:

Specific gravity	1.59
Weight per solid gallon (lbs.)	13.24
Bulking value (gal. per lb.)	0.07553
Oil absorption	46.
Light resistance	
Full shade	excellent
Tints	excellent
Ease of grinding	excellent
Resistance to heat, soap, alkali, water, acid	excellent
Bleeding in plasticizers, paraffin, synthetics, lacquer, linseed oil, mineral spirits, toluene, alcohol	none

A technical bulletin giving more detailed information on Solfast Blue G 43100 is available from the company.

Rotary Paddle Feeder

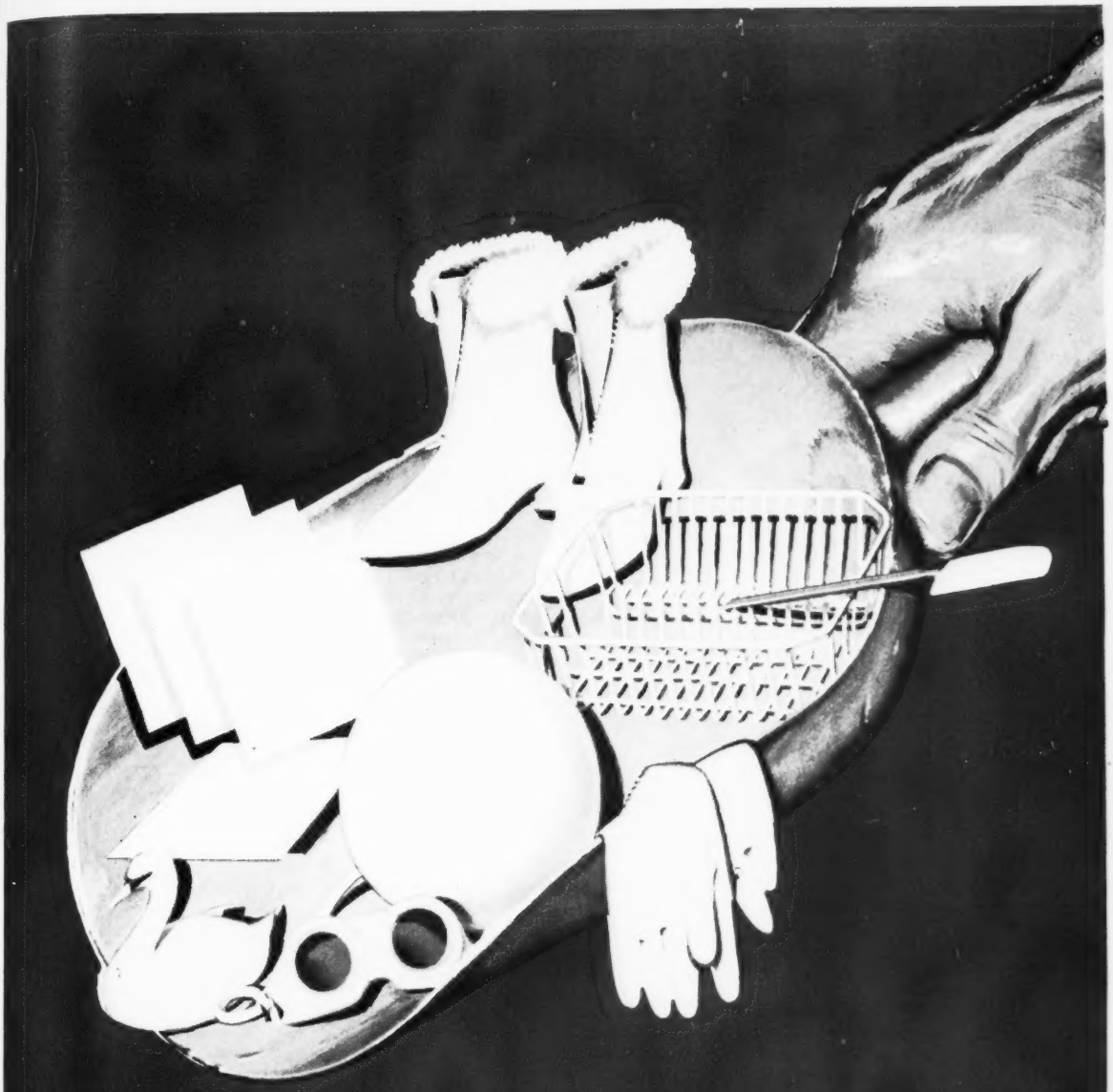
(*Continued from page 584*)

also seen for delivering other small granular material. Capacities handled are up to 30 cubic feet per minute.

Some specifications are: standard inlet opening is 8 by 15.5 inches, and standard outlet is 12 by 15 inches. These measurements, however, are dependent upon the amount of material flow desired. Headroom for the unit has been reduced to 18 inches. Overall width is 20.5 inches.

The sealed ball bearings are placed above the stream of material for protection from leakage. A ¾-hp. gearhead motor with chain drive is normally used, but for special applications variable speed drive is available.

Further information about the paddle feeder may be had from the company.



LIGHT LOADING FOR EXTRA BRIGHTNESS

There's ready wetting and easy dispersion in store for users of UNITANE O-220. High opacity and clear color tone are the result . . . an *economical* result because of the unsurpassed whitening power of this titanium dioxide pigment.

Production people will appreciate the freedom from agglomeration . . . the non-reactivity with rubber chemicals . . . the minimum loading requirements. The *only* effect of UNITANE O-220 in rubber compounding is the production of top-quality whites and pastels.

Full information and samples will be gladly furnished by your Cyanamid Pigments representative.

. . . because

UNITANE® O-220

TITANIUM DIOXIDE

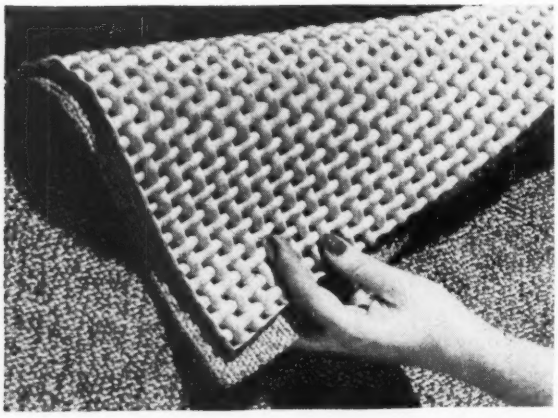
is made to give rubber its ultimate in whiteness

CYANAMID

AMERICAN CYANAMID COMPANY
Pigments Division
30 Rockefeller Plaza
New York 20, N. Y.
Branch Offices and Warehouses in Principal Cities

WHITER AND BRIGHTER WITH UNITANE

NEW PRODUCTS



U. S. Marvelaire rug underlay

Marvelaire/Regalaire Rug Underlays

United States Rubber Co., New York, N. Y., has introduced a luxurious-feeling basketweave sponge rubber underlay, called U. S. Marvelaire, to be sold through the company's branch sales organization, and U. S. Regalaire carpet cushion, to be sold through the wholesale organization.

Marvelaire and Regalaire are made of highly resilient sponge rubber in an appealing, distinctive basketweave designed to give more body, more luxurious feel underfoot, and added tensile strength. The overall 440-gage, approximately ⅞-inch thick material is backed with a strong closely woven net fabric. It will be produced in 53-inch and in nine-foot widths.

The addition of Marvelaire and Regalaire will give the company's national branch and wholesale organizations a complete line of flat sponge and waffle-type rug underlays in all price ranges for use under carpets and rugs plus material to anchor scatter rugs, oval braids, orientals, and fiber rugs.

New Pile Driver Hose

Republic Rubber Division of Lee Rubber & Tire Corp., Youngstown, O., has announced a new type of pile driver hose construction. In the pulsating service of pile driving the intermittent pressures keep forcing the tube away from reinforcements until finally the tube tears loose. In Republic's new construction the objective of strong adhesion of tube to reinforcements without sacrificing flexibility and strength is accomplished by a combination of asbestos, wire braid, and oil-resisting rubber tube.

Field use to date has proved the superior construction; and in the laboratory, a test simulating pile driving conditions showed no failures after 87 days of 24-hour testing. The test, with 200-pound steam pressure and periodic lubricating oil injection, consisted of shutting off steam every eight hours, closing hose ends, then allowing hose to cool down for one hour, and turning on steam again. The hose, available in 1½ inches and two-inch sizes, is designed for saturated steam working pressure of 200 psi. Additional information is available from the company.

New Sanitary Hose

A new, heavy-duty sanitary hose for use in creameries, canneries, dairies, food preparation and meat packing plants is being marketed by The Goodyear Tire & Rubber Co., Akron, O.

The new design, called Flexsteel Sanitary, features a braid of high-tensile steel wire and two cotton braids for rugged service. Cover is tan colored and highly resistant to animal and vegetable fats, oils, weather-aging, and abrasion. it is claimed.

The hose is being manufactured in 25- and 50-foot lengths, with inside diameters from 0.5-inch to 1.5 inches. It is said to withstand saturated steam pressures up to 100 psi.

ARco Rubber Repair Kit

Recently developed and marketed by Automotive Rubber Co., Inc., Detroit, Mich., is the new ARco rubber repair kit for repairing tanks, vessels, fittings, and other rubber lined or covered equipment.

The portable ARco rubber repair kit makes it possible for on-the-job maintenance and repairs on rubber lined or covered equipment by shop personnel. Simple and complete application instructions plus all the necessary tools and materials are compactly contained in this durable, self-storing kit.

ARco sheet rubber AR-814 furnished in the kit, 10.5 square feet, is specially compounded to resist all solutions normally contained in rubber lined equipment. ARco sheet rubber AR-814 is $\frac{3}{16}$-inch thick and spark-tested to insure freedom of voids and is guaranteed leakproof. The shipping weight of the kit is 25 pounds.

Special neoprene repair kits are also available from the company.

Ground Refueling Hose

A superior aircraft refueling hose said to be capable of conveying all types of aviation fuels has been developed by Quaker Rubber Division, H. K. Porter Co., Inc., Philadelphia, Pa. The all-synthetic hose, designed to meet rigid government specifications, provides extreme flexibility without loss of high bursting strength.

The tube is made with nitrile type rubber as the base polymer, compounded to prevent swelling or loss of adhesion to the carcass. After careful compounding, the material is extruded to produce a continuous tube of maximum flexibility—suitable for service at temperatures from −65 to +130° F.

Seamless circular woven Dacron warp and filler reinforcement offer maximum bursting strength with a minimum of weight. This type of construction eliminates delamination at the point of constant flex and prevents hose from rupturing while under pressure. Dacron warp and filler make the hose lightweight, which facilitates handling and storage.

The hose is manufactured in oval cross-sections which permit easier handling without excessive twisting or kinking during reeling and unreeling operations. In addition, oval cross-sections maintain sufficient collapse resistance to permit defueling.

The hose is available with static wire interwoven with reinforcing warp yarns. Continual twisting and bending of hose demands this particular construction in order to prevent the wire from breaking, puncturing the tube, or causing a bonding failure.

To protect both reinforcement and tube, the cover is compounded with neoprene as the base polymer for maximum resistance to abrasion and weather. The cover has a uniform spiral wrap surface impression with a minimum thickness of 1/16-inch. The synthetic materials used in the tube and the cover are compounded for satisfactory service at extremely high and low temperatures.

Prior to shipment, the hose is hydrostatically tested with aviation fuel to eliminate possible contamination under actual operating conditions. Ends of the hose are protected by screw caps on the couplings to prevent accumulation of foreign materials during shipment or storage.

If Special Interest to Canadian Rubber Manufacturers . . .

The Rubber Regenerating Co ltd

TRAFFORD PARK · MANCHESTER · ENGLAND

The Largest Producers of Reclaimed Rubber in the British Empire!

- High grade reclaims from ALL NATURAL rubber scrap
- Competitive prices
- Prompt shipment
- Delivery direct to customer's plant
- Local stocks
- Continuity of supply

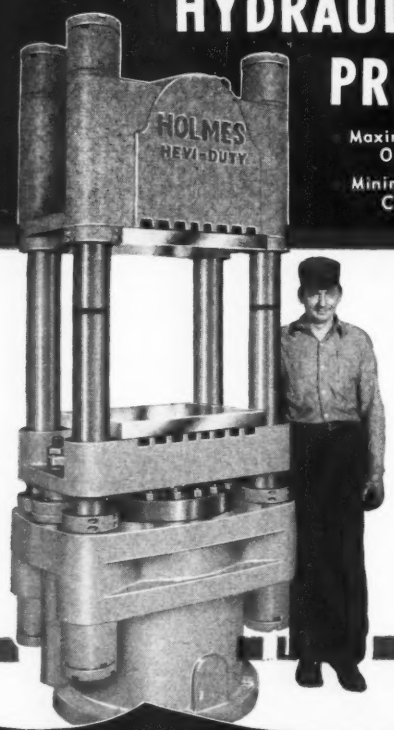
For samples, prices and further particulars apply to our sole agents in Canada

H.L.BLACHFORD Limited

MONTREAL:-977 Aqueduct Street

TORONTO:-360 Old Weston Road

Now... PRECISION MOLDING
is NO PROBLEM
with the new and improved
HOLMES
HYDRAULIC
PRESS
Maximum Output
Minimum Cost



New Features--Precision Results

The new and improved Holmes Hydraulic Press retains all the features of its famous predecessors... PLUS...many outstanding improvements. These put it in a class by itself--for all kinds of general purpose work...and...special production where close tolerance is required. Low in price. Practically no maintenance. Will quickly pay for itself in any processing plant.

WRITE OR WIRE FOR SPECIFIC DETAILS--regardless of your particular requirements. With 52 years know-how specializing in machinery and molds for the rubber industry--Holmes can help you solve your problems, too, just as they have for so many others. No obligation, of course.

SEND FOR ILLUSTRATED FOLDER...TODAY

Stanley E. HOLMES Company
1200 W. Lake Street, Chicago 24, Illinois

TECHNICAL BOOKS

BOOK REVIEWS

"The Analysis of Rubber and Rubber-Like Polymers." By William C. Wake, Research Association of British Rubber Manufacturers. 250 pages. RABRM Manual No. 3. Published for and obtainable from *Rubber Journal & International Plastics*, Maclaren House, 131 Gt. Suffolk St., London, S.E.1, England. Price $8.

The introduction to this book presents a logical, clear view of the polymers considered, the analytical problem, the scope of the book, and the general principles involved and does this in an enjoyable way with a hint of dry humor expertly used. Written in a free and readable style, it is informative to the uninitiated without offending the experienced.

The book continues in this vein through eleven comprehensive chapters of useful information and critical discussion, much of which will be new to rubber analysts in this country. The fault with the choice of content, if any, lies in the absence of detail on British Standards Institution methods, which are not generally available in the United States.

There is an excellent chapter on extraction theory and practice containing much common sense information on interpretation and many useful suggestions for American analysts concerning extraction solvents and methods. The chapter on qualitative analysis for polymer type is to be recommended for its completeness and its logical chemical and spectroscopic approach to the subject, and some relatively unknown methods of attack are discussed. Dr. Wake questions the reasons for survival of some standard American methods. He could not know that a critical review of these methods is in progress and that some of the methods have been found to be in effective use while others will be revised or eliminated.

In the chapter on elemental analysis we find a strange mixture of methods we normally consider to be obsolescent or too slow for practical use with some very modern analytical methods of great value. The discussion of unsaturation methods in the chapter on polymer functional group analysis is of particular value, especially when linked with the excellent and unusual chapter on solution and dissolution methods of treating polymers prior to analysis. There is a fertile field here although we reserve the right to question the validity, or perhaps the interpretation, of unsaturation values determined on a dissolved polymer which has been strongly aerated at 180° C.

The entire subject of analysis of extracts for sulfur, accelerators, antioxidants, or plasticizers is very adequately treated; the modern chromatographic methods are clearly described. The author is rightly concerned here with some standard American methods and definitions involving free sulfur. There is also a brief and lucid exposition in the final chapter on the value and fundamental uses of statistical methods in studying the causes of variance in rubber analysis.

We feel strongly that this book is essential to proper operation of a modern rubber analysis laboratory, large or small.

WILLARD P. TYLER

"Symposium on Effect of Ozone on Rubber." ASTM Special Technical Publication No. 229. Chairman, G. C. Maassen. Cloth, 6⅛ by 9 1/16 inches, 134 pages. American Society for Testing Materials, Philadelphia, Pa. Price $3.75; to members $3.00

This is a report on the first symposium sponsored by ASTM Committee D-11 on Rubber and Rubber-Like Materials devoted entirely to ozone and its effects on rubber. A similar

URETHANE FOAMS PERFORM BETTER, LAST LONGER WITH **WITCO FOMREZ® RESINS**

RIGID
or
FLEXIBLE...

Top-quality urethane foams are a natural with Witco's new Fomrez resins. Adaptable to a wide range of foam densities, they are easy to handle and outstandingly uniform, insuring the highest degree of batch-to-batch reproducibility. There's a Witco resin for every type of foam, both flexible and rigid. Mail coupon for details.

FOR FLEXIBLE FOAMS

Witco Fomrez No. 50... Witco Fomrez No. 70

For the production of high-quality flexible urethane foams, adaptable to both "one-shot" and prepolymer foaming systems. Widely applicable in industries such as automotive, aviation, furniture, clothing, packaging, bedding, sports equipment, and many others.

FOR RIGID FOAMS

Witco Fomrez R-400... Witco Fomrez P-420

Foaming systems for producing low to high density rigid foams possessing excellent structural strength, uniform cell structure, heat and dimensional stability. Can be foamed in-place by batch, continuous or intermittent machine-mixing or spray-foaming methods. *Rigid foam uses:* thermal insulation (refrigerators, freezers, pipes, tanks, etc.); structural reinforcements (core material for structural sandwich panels, wall panels, etc.); potting or encapsulation of electric components; flotation equipment.

Witco Chemical Company, Inc.
122 East 42nd Street, New York 17, N. Y.
Chicago • Boston • Akron • Atlanta • Houston • Los Angeles
San Francisco • Oakville, Ontario • London and Manchester, England
A Growing Source of Chemicals for Industry

Please send me details of Fomrez products. RW 1-59

Name_____

Company_____ Title_____

Address_____

City_____ Zone____ State_____

NOW

6 REDS
#297
#347
#387
#477
#567
#617

3 TANS
#10
#15
#20

9

MAPICO COLORS FOR RUBBER...

OUTSTANDING ALL THE WAY!

Because ... these are high-color iron oxide pigments of outstanding purity, providing unusual brightness in mass tone and clarity in tints.

EXCELLENT AGING CHARACTERISTICS WITH BOTH NATURAL AND SYNTHETIC RUBBER

- *Clean, bright color and tint*
- *Easy dispersion and processing*
- *Permanent color*
- *Exceptional strength*
- *Fine particle size*
- *Tear and flex resistance*
- *Controlled pH*
- *Also available: Mapico Yellows, Browns and Black*

You can have full technical assistance—all the information you need—for your particular application. Write today!

MAPICO IRON OXIDES UNIT
COLUMBIAN CARBON COMPANY
380 Madison Avenue, New York 17, N. Y.

Branch offices and agents in principal cities.

Technical Books

symposium in 1949, held in Chicago, dealt with all types of rubber degradation, and ozone attack was a part of only one paper. In the interim much interest has been generated about the ozone problem, and considerable work has been going on in various laboratories throughout the country.

This book is the collection of the papers presented at St. Louis, Mo., as a two-session symposium, on February 10, 1958, as part of the ASTM Committee Week. Discussions which took place are also included following each paper. The contents include an introduction by G. C. Maassen; "Rubber and Its Environment," A. J. Haagen-Smit; "A Study of the Action of Ozone with Polybutadiene Rubbers," E. R. Erickson, R. A. Berntsen, E. L. Hill, Paul Kusy; "The Reaction of Ozone with Rubber," Harold Tucker; "Ozone Resistance of Elastomeric Vulcanizates," Z. T. Ossefort; "Chemical Antiozonants and Factors Affecting Their Utility," William L. Cox; "Prevention of Ozone Attack on Rubber by Use of Waxes," S. W. Ferris, S. S. Kurtz, Jr., J. J. Sweely; "Comparison of Accelerated and Natural Tests for Ozone Resistance of Elastomers," G. N. Vacca; "Quantitative Measurement of Rate of Ozone Cracking," A. G. Veith; "Report on Interlaboratory Ozone Test Program of ASTM Committee D-11, Subcommittee XV, 1957," A. G. Veith.

NEW PUBLICATIONS

"The Use of Hi-Sil 233 in Tire Treads." Columbia-Southern Chemical Corp., Pittsburgh, Pa. 14 pages. October, 1958. This booklet announces a price reduction to 7½¢ per pound, f.o.b. Barberton, O., to a consumer contracting for 10,000 tons per year or more and goes on to show the comparison of Hi-Sil 233 *vs.* carbon black on a cost-quality basis. Columbia-Southern contends that the rising carbon black prices and the falling silica prices have met and now show favorable economies to users in the Akron, O., Detroit, Mich., areas where the freight costs from Barberton being less than those from Texas make this possible. It is pointed out that on a strict reinforcing pigment comparison the black is better than the silica even though the silica today is better than blacks of a few years ago. While conceding that it may turn out that silicia cannot match black properties, the company contends that silica will make a good tread, and a dollar's worth of silica will make tires which give as much or more service than tires with a dollar's worth of carbon black. The report also points out the fears in some quarters of diminishing supplies of oil and gas for black manufacture while the available sand for silica use is extremely abundant. Columbia-Southern believes that this will also act to raise black prices while silica prices are expected to continue to decline. There are also some tables of tire tread performance using Hi-Sil, some information of using existing bulk handling for silicas, and a copy of the report on toxicity which indicates Hi-Sil to be quite safe to handle.

"Radiochemical Price List 1058." Research Specialties Co., Berkeley, Calif. 12 pages. This 1958 edition of the radiochemical price list of C^{14}-compounds includes the production of 38 new compounds manufactured by the company. The convenient nine-by four-inch size and uncomplicated format of previous editions is retained, and additional cross-referencing of names of compounds increases the ease of finding desired items. Listed is the company's exclusive spectro-grade isooctane C^{14}. Other noteworthy compounds are guanine-2-C^{14}, guanine-8-C^{14}, and thymine-2-C^{14}.

"M-615 for Extrusion with GR-S 1805 (Oil-Black Masterbatch)." Midwest Rubber Reclaiming Co., East St. Louis, Ill. 4 pages. The purpose of this report is to show how a very well-refined, high specific gravity whole-tire reclaim may be used with SBR 1805 (SBR extended with 37.5 parts of naphthenic oil plus 75 parts of HAF black) to give improved processing and smooth extruded, open steam cured goods of excellent quality.

"Spiral-Flow Intensive Mixers for Rubber and Plastics." Stewart Bolling & Co., Inc., Cleveland, O. 12 pages. This completely revised bulletin describes the company's internal mixers and shows the variety of drives offered. It also shows the latest mixers, the full range of sizes, with the variety of drives applied. Latest specifications and illustrations are given.

"Harwick Clays in Rubber." Bulletin #01-13-3-8-58. Harwick Standard Chemical Co., Akron, O. 2 pages. This revised bulletin covers the types and properties of the Harwick Clays which include Harwick Clay #12. This new clay is surface treated with a wetting agent and is recommended for use in latex applications.

"How to Get Longer Life from V-Belt Drives." Catalog No. IP-1577. B. F. Goodrich Industrial Products Co., Akron, O. 12 pages. This manual tells how to select and install V-belts, how to detect V-belt trouble, diagnose belt failures, and correct drive troubles. A list of valuable tips for belt maintenance is included as well as a suggested inventory survey check list for V-belt drives.

"Antara Chemicals Catalog." Antara Chemicals, sales division of General Aniline & Film Corp., New York, N. Y. 64 pages. This expanded and completely revised chemicals catalog is divided into separate sections devoted to surfactants, organic intermediates, acetylene derivatives, carbonyl iron powders, ethylene oxide and glycols and numerous specialty chemicals, including optical brighteners, ultra-violet light absorbers, etc. It also describes the composition, properties and uses of these products.

"Norelco Electron Optics." Philips Electronics, Inc., Mount Vernon, N. Y. 16 pages. This new booklet, RC 178A, contains engineering on the company's Norelco electron optical instruments. Separate sections of it are devoted to the EM-100B and EM-75B electron microscopes, the PMR X-ray microscope, and the CMR contact microradiographic unit. Photographs, micrographs, and diagrams show details of construction, accessories, and applications. Complete specifications are included for each of the four instruments.

"Customeering." The Ohio Rubber Co., Willoughby, O. 6 pages. This photo-filled pamphlet describes how Ohio Rubber uses the fully automated "Select-O-Weigh" proportioning system to provide a custom rubber production service. The company's complete rubber and vinyl production facilities are outlined. Described are services including compounding and coloring; designing and building molds and dies; special tools and fixtures; bonding; injection, compression, transfer, and flash-free molding; extrusion, laboratory facilities; quality control; and production control.

"Ethylene Glycols." Jefferson Chemical Co., Inc., Houston, Tex. 40 pages. This technical bulletin presents a comprehensive review of the physical and chemical properties and industrial uses of the company's ethylene glycol, diethylene glycol, triethylene glycol, and tetraethylene glycol. This technical manual, available for general distribution, also provides data on methods of shipments and specifications and analytical techniques required for determining product quality and also includes a comprehensive indexed bibliography. The glycols described find extensive uses as intermediates in the production of organic and inorganic esters, ethers, acids, and aldehydes. They also find applications in the dehydration of natural gas, anti-freeze and explosive formulations, resins, plastics, and plasticizers.

"'Shaftex' Speed Reducers." Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4 pages. This new bulletin, 20B9053, describes the construction and operating features of the company's "Shaftex" speed reducer, a completely enclosed unit for direct mounting on the driven shaft. The new "Shaftex" comes in sizes up to 40 hp. and with nominal internal gear ratios of 5:1, 15:1, and 20:1. Variable speeds can be obtained by using either stationary control or motion control Vari-Pitch sheaves.

Publications of the Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.:

"Flexzone 6-H." By F. B. Smith. Bulletin No. 220-A. 12 pages. This bulletin describes and gives formulations for the use of Flexzone 6-H, an antioxidant-antiozonant for weather protection and flex cracking resistance in rubber. Recommendations, tables, and photographs are included.

"B-L-E 25." By F. B. Smith. Compounding Research Report No. 19-A. 14 pages. This revised report describes B-L-E 25, a standard antioxidant for combined heat, oxygen, and anti-flex cracking protection where discoloration is not a problem. Important points are highlighted in each section. Complete information on compounding B-L-E 25 is obtained by studying the detailed data following the highlights.

"Phillips 66 Hydrocarbons and Sulfur Chemicals." Phillip Petroleum Co., Bartlesville, Okla. 136 pages. This fifth-edition catalog contains specifications and technical data on the company's many hydrocarbons and sulfur chemicals. In addition to the new products now regularly available, there is a list of other chemicals currently supplied in limited quantities, but potentially available in larger volume. A section on test methods for hydrocarbons is included.

"Rims." The Goodyear Tire & Rubber Co., Akron, O. 94 pages. This multi-purpose catalog contains pictures, information, and engineering data on the company's rims, wheels, tools, and rim accessories. Text includes information and pictures on rim research, step-by-step procedure for mounting and demounting rims, and operating instructions for using hydraulic tools. A complete listing of the company's rim distributors is included.

Publications of the Office of Technical Services, United States Department of Commerce, Washington, D. C.:

"Antiozonants for Nitrile and Natural Rubbers." E. W. Bergstrom, Rock Island Arsenal Laboratory. Order PB 131267. July, 1956. 47 pages. $1.25. The effectiveness was determined of various types of commercial and specially synthesized chemicals in protecting nitrile and natural rubber vulcanizates from accelerated and atmospheric ozone attack. The alkyl-p-phenylenediamines afforded the best protection to nitrile rubbers in accelerated static ozone exposure tests. Antiozonants were found less effective in natural rubber vulcanizates than in SBR or nitrile rubber vulcanizates.

"Evaluation of Coral Rubber (*Cis*-Polyisoprene)." J. C. Montermoso, A. Wilson, and C. B. Griffis, QR&DC, U. S. Army. Order PB 131232. April, 1957. 15 pages. 50¢. *Cis*-polyisoprene, the basic material of natural rubber, has been synthesized by several major rubber companies, with resulting properties reported to be identical to those of natural rubber. This study confirms that claim. Coral rubber, submitted by Firestone, was tested and found to be practically the same as the natural material in physical properties and aging characteristics. Chemical resistance was almost identical, and the synthetic material was slightly superior to natural rubber in low-temperature tests.

"A Study of the Effects of Nuclear Radiations on Elastomeric Compounds and Compounding Materials: Part I." D. L. Loughborough, A. E. Juve, J. R. Beatty, and J. W. Born. The B. F. Goodrich Co., Akron, O., for WADC, U. S. Air Force. Order PB 121811. August, 1956. 107 pages. $2.75. A major finding was a group of chemicals, normally used as antioxidants, which markedly inhibit radiation effects in natural rubber pure gum and black compounds. The research provided engineering information on the effect of nuclear radiation on the common elastomers and elastomeric compounds, and compounding ingredients. More than 190 different materials were compounded, irradiated, tested, and evaluated. Cobalt 60 was the source of gamma radiation.

"Development of Thermally Stable Polymeric Materials." C. P. Haber, U. S. Naval Ordnance, for WADC, U. S. Air Force. Order PB 131253. June, 1957. 67 pages. $1.75. This work was undertaken under a program to synthesize polymeric materials with extreme chemical and thermal stability for use in various aircraft applications such as elastomers, plastics, fluids, dielectrics, and adhesives. Diphenylvinylsilane was prepared in good yields. In an attempt to prepare $(CF_3)_2PN$ polymers, a multistep synthesis was developed which gave an excellent overall yield of the desired starting material, $(CF_3)_2PCl_3$. Side reactions prevented preparation of the desired nitride powder.

MARKET REVIEWS

Natural Rubber

During the November 16-December 15 period the market on good factory interest advanced about ¾¢. Toward the close of this period the market quieted and appeared to be drifting in anticipation of the holiday season.

American buying of December and January arrival rubber has been in fair volume, and manufacturers elsewhere are believed to be poorly covered. Consumers, however, not unnaturally backed away from the large Far Eastern offerings, and on the whole the selling found the main markets unprepared for the development and, therefore, not in a position to absorb it.

World new rubber consumption totaled an estimated 3,130,000 long tons in 1958, nearly equal to the amount consumed in 1957. Rising consumption in the Free World outside the United States and a sharp step-up in natural rubber in the Soviet bloc countries offset the decline in United States new rubber requirements. Natural rubber imports into the Soviet bloc countries were estimated at about 350,000 long tons in 1958, or about 20% more than the 1957 total.

November sales, on the New York Commodity Exchange, amounted to 10,070 tons, compared with 11,350 tons for October contract. There were 17 trading days in November, and 20 during the November 16-December 15 period.

REX CONTRACT

1958	Nov. 21	Nov. 28	Dec. 5	Dec. 12
Nov.	33.00	....	....	....
1959				
Jan.	32.10	31.15	30.05	29.55
Mar.	31.70	30.87	29.80	29.22
May	31.55	30.60	29.60	29.05
July	31.40	30.50	29.45	28.90
Sept.	31.35	30.25	29.30	28.80
Nov.	31.30	30.20	29.20	28.70
1960				
Jan.	....	30.15	29.10	28.60

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 31.14¢ per pound for the November 16-December 15 period. Average November sellers' prices for representative grades were: RSS #3, 31.23¢; #3 Amber Blankets, 26.66¢; and Flat Bark, 22.66¢.

NEW YORK OUTSIDE MARKET

	Nov. 21	Nov. 28	Dec. 5	Dec. 12
RSS #1	32.00	31.88	30.25	29.37
2	31.63	31.50	29.88	29.25
3	31.38	31.13	29.25	28.88
Pale Crepe				
#1 Thick	33.88	33.75	32.25	32.00
Thin	34.13	34.00	32.50	32.25
#3 Amber Blankets	26.88	26.50	26.38	26.13
Thin Brown Crepe	26.50	26.25	26.13	26.00
Standard Bark Flat	22.88	22.63	21.88	21.25

Synthetic Rubber

New rubber consumption for November was still running at a high rate although not so high as in October. The consumption of all types of synthetic rubber in November amounted to 79,375, compared to October's 88,015 long tons. Synthetic rubber accounted for 64.40% of the total new rubber figure, amounting to 123,252 long tons, according to figures released by The Rubber Manufacturers Association, Inc., in its regular monthly report.

Consumption of synthetic rubber by types in November, as compared to October figures in long tons, was as follows: SBR, 66,422, against 73,242; neoprene, 6,117, against 7,105; butyl, 4,442, against 4,982; nitrile, 2,394, against 2,686.

Synthetic rubber exports also had a good month in November although most types showed a slight decline when compared to October figures. The exception was neoprene, which had a rise of about 1,200 long tons.

While slight declines were noted in consumption during November when compared to October use, November must still be considered a very good month. The trend follows the usual year-end pattern, and with December consumption also indicated at a high level, the fourth quarter of 1958 should be a very good one. Predictions are now made that the first quarter of 1959 will continue to show the upward trend, with rubber consumption even slightly higher than it was during the final quarter of 1958.

Latex

The liquid latex market has been influenced by the recent downward movement in the natural rubber prices, but a certain resistance to follow the drop in values of dry rubber to its full extent has been noticeable.

Producers, especially of bulk latex, appear more reluctant sellers of late, and with buying interest in evidence, though on a moderate scale, and with supplies of nearer positions becoming scarce, the differential has again tended to harden.

Consumption here of natural latex increased in October to 7,725 tons, against 6,748 tons in September. Stocks here were only 10,334 on October 31, as compared with 12,482 tons at the end of September. At the present rate of consumption the stock position would appear to be rather precarious for consumers. Consumption of SBR and other synthetic latices also increased in October.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car ran about 36.44¢ per pound solids. Synthetic latices prices were 21.5 to 38.2¢ for SBR; 37 to 53¢ for neoprene; and 46 to 60¢ per pound for the nitrile types.

Final September and preliminary October domestic figures for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Sept.	0	*	6,748	12,482
Oct.	0	*	7,725	10,324
SBR				
Sept.	6,165	—	5,779	6,842
Oct.	7,617	—	6,534	7,129
Neoprene				
Sept.	1,075	0	820	1,354
Oct.	1,170	0	979	1,365
Nitrile				
Sept.	1,173	0	1,017	2,096
Oct.	1,308	0	1,120	2,229

*Not available yet for period covered.

Reclaimed Rubber

During the November 16-December 15 period a definite increase in reclaimed rubber consumption was attributed to an upsurge in original-tire business for the automotive market. There was not the expected drop-off in replacement tires, but rather a continued increase. The auto-mat market worked up to the usual peak, and even the battery box field reacted to the demand for original equipment. Hose and belting picked up from their previous slump, according to one source.

All of the above branches of the rubber industry are expected to continue to use reclaimed rubber in in-

CYANAMID RUBBER Chem Lines

20 OF A SERIES Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

Accelerator Comparison Shows Useful Cure Relationships

An interesting demonstration of curing speed range is given below for the complete line of accelerators now available from Cyanamid. These include the fast-acting MBT, the slightly slower MBTS, and the moderately delayed-action accelerators CYDAC and NOBS No. 1. Completing the line are NOBS Special and DIBS, with the latter offering the greatest delayed action available to the rubber industry today.

For the purpose of comparison, a typical tire tread compound was chosen using SBR 1600, a 50 per cent HAF black masterbatch. To accurately define cure characteristics after the inception of vulcanization, data were taken at five-minute intervals in the early stages of cure.

WIDE PROCESSING RANGE

The comparative degree of processing safety is illustrated by the scorch times given below for these DPG-activated accelerators.

MOONEY SCORCH (MS) at 280°F
10-point rise above minimum

Thiazoles		Sulfenamides	
MBT	17	CYDAC	29
MBTS	19	NOBS No. 1	41
		NOBS Special	44
		DIBS	52

SULFENAMIDES EQUIVALENT IN CURE

The similar cure characteristics of the four sulfenamide accelerators are obvious from Figure 1. The maximum tensile properties are essentially the same for optimum cures with each sulfenamide. The relative position of each curve at the inception of vulcanization corresponds to the scorch times in that the CYDAC-accelerated stock is the first to start curing, while NOBS No. 1, NOBS Special and DIBS follow in that order.

The significant part of these data is the similar slope of each sulfenamide curve from inception of vulcanization to optimum tensile strength. The similarity in curve slope indicates that the curing rates of the sulfenamide-accelerated stocks are essentially equivalent.

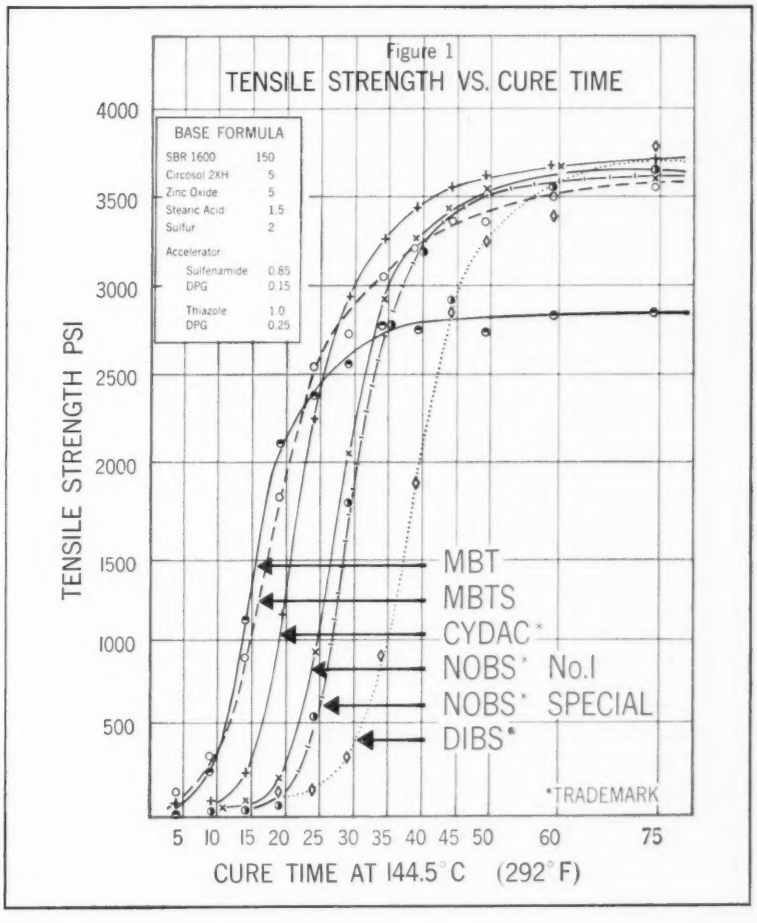
This means that the compounder has available a complete line of delayed-action accelerators to provide the necessary degrees of processing safety *at no sacrifice in cure rate.* This point may often be overlooked by compounders who mistakenly associate the long-delayed action of NOBS and DIBS with slower curing rates.

MBTS is similar in its cure characteristics, although the curve is not quite so sharp in the shoulder portion. The other thiazole, MBT, does not give as tight a cure and would not be used in this type of compound.

COMPLETE ACCELERATOR SERVICE

Compounders requiring rapid cure and negligible process safety or high mixing temperatures with the need for delayed-action acceleration will find the proper accelerator available from Cyanamid. Write for data on this complete range.

Figure 1



creasing amounts as the business pick-up continues.

According to The Rubber Manufacturers Association, Inc., report, November production of reclaimed rubber was 22,300 long tons; while consumption was 22,970 long tons.

Prices of reclaimed rubber continued the same.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Rayon and Nylon

Forty-four per cent of all passenger-tire replacement sales in 1958 were said to be nylon cord tires, according to reports received by one tire cord producer from service station chains and special tire sales organizations, such as mail-order houses, auto supply stores, and farm cooperatives.

The 1958 estimate reflects a rising trend in the sales rate of nylon cord tires in the replacement field as the year had progressed. At present nearly 50% of all tires sold as replacements are constructed with nylon cord.

The oil companies and the special-brand marketers account for one-half of total replacement sales of passenger tires in the country. Their sales are running at about 4% above 1957 figures. Nylon's share of this important segment of the tire market in 1958 was expected to be more than double the 20% held in 1956.

Many of the special-brand retailers recently upgraded their sales by placing increased emphasis on nylon cord tires. Four large oil companies with nation-wide distribution report increases in nylon-cord tire sales from an average level of 40 to 100% of all passenger tire sales, it was reported.

During the period under review there was no new information released concerning the marketing of Tyrex tire cord.

Totaled packaged production of rayon and acetate filament yarn for November totaled 52,600,000 pounds, consisting of 29,200,000 pounds of regular tenacity rayon yarn, and 23,400,000 of high-tenacity rayon yarn. October production had been: total, 57,400,000 pounds, including regular-tenacity rayon yarn, 33,300,000 pounds; high-tenacity rayon yarn, 24,100,000.

Filament yarn shipments to domestic consumers for November amounted to 55,000,000 pounds, of which 24,600,000 pounds were high-tenacity rayon yarn, and 30,400,000 pounds were regular-tenacity rayon yarn. October shipments had been: total, 57,600,000 pounds; high-tenacity, 23,800,000 pounds; regular-tenacity, 33,800,000 pounds.

Stocks on November 30 reached 55,700,000 pounds, made up of 11,900,000 pounds of high-tenacity rayon yarn and 43,800,000 pounds of regular-tenacity rayon yarn. End-of-October stocks had been: total, 59,200,000 pounds; high-tenacity rayon yarn, 13,400,000 pounds; regular-tenacity rayon yarn 45,800,000 pounds.

No changes were made in rayon and nylon prices since the last report.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.625/$0.78
1650/908/2	.685/ .685
2200/980/2	.625/ .655

Tire Yarns

High-Tenacity	
1100/ 490, 980	.66/ .66
1100/ 490	.66/ .66
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.60
1900/ 720	.58

NYLON PRICES

Tire Yarns

840/ 140	$1.10/$1.20
1680/ 280	1.20

Scrap Rubber

During the November 16-December 15 period there was a fair amount of activity in the scrap rubber market, with reclaimers continuing to accept shipments regularly. Reclaimers have been finding an outlet for their reclaimed rubber in the automotive industry. Prices were unchanged; mixed auto tires were $7 to $11 in the East, with the high side of the range applicable only on shipments to Buffalo.

Scrap rubber exports dropped substantially during September; while exports of reclaimed rubber showed an increase, according to figures released by the Bureau of the Census, United States Department of Commerce.

September scrap rubber exports totaled 2,227,731 pounds, valued at $87,628, compared with August's 3,141,746 pounds, worth $122,528. The decline amounted to 914,015 pounds in September.

Exports of reclaimed rubber in September amounted to 2,521,480 pounds, valued at $248,915, or 235,381 pounds more than August's 2,016,099 pounds, worth $222,017.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.75	2.75
Black	5.75	5.75
Red	6.25	6.25
Butyl	3.50	4.00

Industrial Fabrics

Toward the close of the period under review industrial grey cotton goods experienced a quieter market than during previous weeks. Mills had accumulated so many more orders that the contraction in sales volume was more welcome than otherwise, especially on the most wanted constructions. Releases by coaters diminished, but coaters' work backlogs are meanwhile quite heavy, and more such business is awaiting continued gains in automobile output.

Quotations have continued to edge up despite the maintenance of selling levels by a number of companies. To this extent the policies on prices are at a stage of partial stabilization. Examples of individualistic pricing disposition are reflected in wide sheetings. Once on-hand yardage moves out, firmer asking levels will tend to take effect.

Ducks were the quietest item in the list. But mills had booked the first sizable contract business in many months in the case of hose and belting and numbered ducks. Of hose and belting ducks 60¢ was the price bid regardless of quantity. The rise of 2.5% in the list price for numbered ducks brought mills business after a long wait.

Industrial Fabrics

Broken Twills*

54-inch, 1.14, 76x52	yd.	$0.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825

Drills*

59-inch, 1.85, 68x40	yd.	.365
2.25, 68x40		.2975

Osnaburgs*

40-inch, 2.11, 35x25	yd.	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.275
62-inch, 2.23, 32x26		.2875

Ducks
Numbered Duck†

List less 45%

Hose and Belting Duck*

Basis	lb.	.60

U. S. Shor-Kwik inflatable dunnage by U. S. Rubber Co. uses Wellington Sears nylon fabric.

Fabric helps protect cargo with cushions of air

Unoccupied box-car space can cause costly damage to goods in transit. This space must be controlled by "dunnage," usually consisting of elaborate blocking, bracing and strapping, to keep cargo from shifting or breaking loose.

These days, rigid bracing is being replaced more and more by new *inflatable* dunnage. Bags made of a neoprene-coated nylon fabric, enclosing a butyl rubber air chamber, are placed in position and inflated. They hold cargo firmly yet resiliently. This method is fast and cheap. Inflatable dunnage reduces cargo handling costs, cuts down damage claims considerably. It deflates easily for return shipment.

Once again, as in so many of the recent new developments in rubber and plastics, Wellington Sears provides the fabric. It is another important example of how this company continues to add to its record of textile service to industry for more than a century. This experience is yours to call on for help in solving your fabric problems. For free copy of "Fabrics Plus," write Department H-1.

WELLINGTON SEARS

FIRST In Fabrics For Industry

For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products

WELLINGTON SEARS COMPANY, 111 WEST 40TH STREET, NEW YORK 18, N. Y.

Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

Enameling Ducks*

	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.45	.46
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Army Duck†

52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	yd.	.5925

Sheeting*

40-inch, 3.15, 64x64	yd.	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.2275
57-inch, 3.47, 48x48		.235
60-inch, 2.10, 64x64		.36
2.40, 56x56		.31

Sateens*

53-inch, 1.12, 96x60	yd.	.565
1.32, 96x64		.52
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.625
1.21, 96x64		.5725

Chafer Fabrics*

14.40-oz./sq.yd. P.Y.	lb.	.67
11.65-oz./sq.yd. S.Y.		.61
10.80-oz./sq.yd. S.Y.		.61
8.9-oz./sq.yd. S.Y.		.67
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

*Net 10 days.
†2% 10 days.

•

MALAYA

(Continued from page 582)

Britain (excluding the Iron Curtain countries) fell from 47.6% of the total 1957 shipments to 43.8% in 1958, although Britain and especially Western Germany bought more rubber in 1958; the share of the United States dropped from 14½% to 11%; Australia, Canada, South Africa, and New Zealand together took 1½% less. A substantial decline in Argentine's purchases brought the 1958 share of South America to just under the 1957 figure. On the other hand, Japan, China, India, and other Asian consumers of natural rubber together accounted for more than 21% of total Malayan exports in 1958, as compared with 16½% in the 1957 period under review.

The tables below compare Malaya's ten best customers for rubber in long tons in 1957 and 1958:

	January-October 1957		1958
(1) Great Britain	162,149	(1)	164,405
(2) United States	117,195	(2)	97,958
(3) Japan	89,128	(3)	92,621
(4) France	55,785	(6)	44,559
(5) West Germany	55,263	(4)	66,775
(6) Italy	41,028	(7)	42,227
(7) Argentina	26,692	†	—
(8) Canada	26,638	†	—
(9) Australia	24,288	(10)	25,697
(10) China	20,955	(5)	64,036
* Russia	—	(8)	39,851
* Poland	—	(9)	28,635

*Not among top ten in 1957.
†Not among top ten in 1958.

Board for Rubber Development Formed

The Malayan Rubber Fund (Research & Development) Bill, for financing research, development, and publicity, for the natural rubber industry, was passed in the Federal Council early in December. A Malayan Rubber Fund Board of ten members to control research policies and activities, will be set up and consist of a Controller of Rubber Research, as chairman, five representatives of the Rubber Producers' Council, and four representatives appointed by the minister responsible for the rubber industry, at present the Minister of Commerce & Industry.

The board will collect cess, administer funds, and control the activities and policies of all research and development organizations wholly or mainly financed by the Fund. Contributions from the Fund will be made to the Rubber Producers' Council, the Rubber Research Institute of Malaya, the British Rubber Producers' Association, and the Natural Rubber Development Board, as well as to international rubber planting, research, and development organizations of which the Malayan Federation is a member.

Industry Notes

Japan is contemplating the establishment of an automobile assembly plant in the Federation of Malaya, which would be the first of the kind here.

Malaya's exports of latex foam rubber have declined steeply in a period of six months as a result of increasing production of these products in her usual markets. In February, 1958, these exports had a value of $196,000 (Straits); in August, 1958, the total was only $100,000. These goods are exported to Burma, Siam, Indonesia, and Hong Kong, and other neighboring Asiatic countries. Malaya, however, is evidently not well able to meet the competition of recently established local factories for latex foam rubber.

Russia

Vinyl Silicone Rubber

Russian sources make mention of a silicone rubber which includes vinyl groups. Some of the methyl groups in polydimethyl-siloxanes are replaced by vinyl radicals, resulting in silastomers that can be vulcanized with sulfur and accelerators. This rubber can be mixed and vulcanized with organic rubber, yielding materials more resistant to heat, weather, and frost than purely organic rubbers. These vinyl silicone rubbers retain their elasticity within a temperature range of —60 to +200° C., and resist oils, corona discharge, and ozone; they also show less shrinkage.

OBITUARY

Stefano Oberto

Stefano Oberto, 51, director of operation research and a member of the research and development committee, Pirelli S.p.A., Milan, Italy, died suddenly on October 3, 1958.

Following his graduation from the University of Torino in 1928 as Doctor in Physics, Dr. Oberto joined the staff of Pirelli. While most of his career was spent with that company, he did leave for a period (1939-1946) to take part in the then-new Italian Synthetic Rubber Program, where he served as a process instrumentation designer and later as a research director. His return to Pirelli was made in 1946 as assistant director of the rubber laboratories. Dr. Oberto next became a member of the research and development committee, in 1954.

Dr. Oberto devoted most of his efforts toward the physical testing of rubber, and most of his published work deals with such aspects as heat of vulcanization, fluorescence and vulcanization, optical anysotropy of vulcanization, microhardness and rebound apparatus, and other testing methods in polymerization and compounding. He made many contributions to rubber standardization working with International Standards Organization, Technical Committee 45 on Rubber, and was a pioneer in using statistical applications to research, development, production, and management problems.

Among his many activities and memberships in societies, Dr. Oberto was a Fellow, Institution of the Rubber Industry, and a member of the American Chemical Society, the American Society of Quality Control, and the Optical Research Society, London. Along with his technical work he was very much interested in the training of young people and served in this respect on the IRI International Education Committee.

Through his membership on the committee ISO TC 45-Rubber he was credited with much of the success of the committee meetings.

Funeral services were held October 4 in Milan, with burial October 5, at None, Italy, which is near Torino where Dr. Oberto was born on November 19, 1906.

The deceased is survived by his widow and two sons.

EAGLE-PICHER

Lead & Zinc Compounds

meet the specific demands of the rubber industry . . .

Eagle-Picher manufactures a comprehensive line of both lead and zinc compounds for the rubber industry. Rigid product control is maintained from the ore to the finished product. More than a century of experience assures you of customer service unequalled in the field.

Zinc Oxides	Litharge
Basic White Lead Silicate	Sublimed Litharge
Basic Carbonate of White Lead	Red Lead (95% 97% 98%)
Sublimed White Lead	Sublimed Blue Lead

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY

Since 1843

General Offices: Cincinnati 1, Ohio

West Coast Sales Agent
THE BUNKER HILL COMPANY, Chemical Products Division
Seattle • Portland • Oakland • San Francisco • Los Angeles • Kellogg, Idaho

CROWN CLAY

SOUTHEASTERN CLAY CO.

AIKEN, SOUTH CAROLINA

Sales Agents

HERRON BROS. & MEYER ..... Akron
SMITH CHEMICAL & COLOR CO. .... Brooklyn, N. Y.
C. M. BALDWIN ..... Chicago
ERNEST JACOBY & CO. ..... Boston
The C. P. HALL CO. of Calif. ..... Los Angeles
THE PIGMENT & CHEMICAL CO., LTD.
Toronto and Montreal

THE CARTER BELL MFG. CO. SINCE CARTER BELL PRODUCTS 1903 SPRINGFIELD, NEW JERSEY

Vulcanized

VEGETABLE OILS

rubber substitutes

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods — be they Synthetic, Natural, or Reclaimed.

A long established and proven product.

THE CARTER BELL MFG. CO.

SPRINGFIELD, NEW JERSEY

Represented by
HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Chicago, Los Angeles, Trenton, Denver, Albertville, (Ala.), Greenville, (S.C.)

Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363 /	$0.065
Rottenstone, domestic	lb.	.03 /	.04
Shellblast	ton	80.00 /	165.00
Walnut Shell Grits	ton	50.00 /	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.50 /	.57
A-32	ton	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator 49		.59 /	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92 /	.97
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.54 /	.56
Arazate	lb.	2.25 /	2.30
Beutene	lb.	.66 /	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04 /	1.09
Butyl Accelerator Eight	lb.	1.35	
Namate	lb.	.45 /	.50
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Captax	lb.	.44 /	.46
Conac S	lb.	.76 /	.78
C-P-B	lb.	1.95 /	2.00
Cumate	lb.	1.45	
Cydac	lb.	.76 /	.78
Dibs	lb.	.85	
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.69 /	.70
Du Pont	lb.	.69 /	.70
DPG (diphenylguanidine)			
Cyanamid	lb.	.49 /	.50
Monsanto	lb.	.52 /	.58
El-Sixty	lb.	.62 /	.64
Ethasan	lb.	1.04	
Ethazate	lb.	1.04 /	1.09
50-D	lb.	.87 /	.92
Ethyl Seleram	lb.	3.00	
Thiurad	lb.	1.04	
Thiram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04 /	1.09
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Ethylac #650	lb.	.93 /	.95
Guantal	lb.	.60 /	.67
Hepteen	lb.	.44 /	.50
Base	lb.	1.85 /	1.90
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44 /	.46
Du Pont	lb.	.44 /	.46
Naugatuck	lb.	.44 /	.49
-XXX, Cyanamid	lb.	.55 /	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54 /	.56
Du Pont	lb.	.54 /	.56
Naugatuck	lb.	.54 /	.59
-W Cyanamid	lb.	.59 /	.61
Merac #225	lb.	.75 /	1.05
Mertax	lb.	.55 /	.57
Methasan	lb.	1.04	
Methazate	lb.	1.04 /	1.09
Methyl Thiram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14 /	1.19
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cynamid	lb.	.88 /	.90
Du Pont	lb.	1.00	
NOBS No. 1	lb.	.76 /	.78
Special	lb.	.80 /	.82
O-X-A-F	lb.	.55 /	.60
Pennac SDB	lb.	.45 /	.48
Pentex	lb.	1.24 /	1.29
Flour	lb.	.30 /	.35
Permalux	lb.	2.25	
Phenex	lb.	.52 /	.59
Pip-Pip		2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55 /	.57
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.76 /	.78
NS	lb.	.80 /	.82
Selenac	lb.	3.00	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30 /	1.55
Tepidone	lb.	.45 /	.45
Tetrone A	lb.	1.98	
Thiates	lb.	.88 /	1.25
Thiofide	lb.	.54 /	.56
S	lb.	.64 /	.66
Thionex	lb.	1.14	
Thiotax	lb.	.44 /	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	$1.04	
M	lb.	1.14	
Trimene	lb.	.56 /	$0.62
Base	lb.	1.03 /	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85 /	.89
Z-B-X	lb.	2.45 /	2.50
Zenite	lb.	.54 /	.56
A	lb.	.69 /	.71
Special	lb.	.55 /	.57
Zetax	lb.	.51 /	.53
Zimate	lb.	1.04	

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1525 /	.1575
Eagle, sublimed	lb.	.1535	
National Lead, sublimed	lb.	.1585	
Red lead, comml.	lb.	.185 /	.195
Eagle	lb.	.1575	
National Lead	lb.	.1625	
PRD-90	lb.	.38 /	.50
White lead, carbonate	lb.	.19 /	.20
Eagle	lb.	.1775 /	.1875
National Lead	lb.	.175 /	.185
Silicate	lb.	.1725 /	.1825
Eagle	lb.	.1625 /	.1725
National Lead	lb.	.1625 /	.1725
Zinc oxide, comml.†	lb.	.145 /	.1925

Accelerator-Activators, Organic

Aktone	lb.	.2125 /	.2325
Barak	lb.	.65	
Capital 170	lb.	.20 /	.25
171	lb.	.1425 /	.1925
255, 258, 710	lb.	.14 /	.19
270	lb.	.1175 /	.1425
261	lb.	.155 /	.18
262	lb.	.16 /	.185
263	lb.	.1775 /	.2025
Curade	lb.	.57 /	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1425 /	.1925
G-M-F	lb.	2.60 /	2.65
PDD-70	lb.	2.70 /	3.00
PGD-25	lb.	1.25 /	1.50
Groco 30	lb.	.1425 /	.1925
35	lb.	.1475 /	.1975
Guantal	lb.	.62 /	.64
Hyfac 410	lb.	.1525 /	.1775
430	lb.	.18 /	.205
431	lb.	.2025 /	.2275
Hystrene S-97	lb.	.1863 /	.2125
T 45	lb.	.1638 /	.19
T-70	lb.	.1738 /	.20
Industrene B	lb.	.1263 /	.1525
R	lb.	.1138 /	.14
158	lb.	.1313 /	.1575
254	lb.	.1413 /	.1675
262	lb.	.1513 /	.1775
Laurex	lb.	.34 /	.38
MODX	lb.	.295 /	.345
NA-22	lb.	1.00	
PND-70	lb.	1.35 /	1.60
Oleic acid, comml.	lb.	.185 /	.225
Emersol 210 Elaine	lb.	.1475 /	.1975
Groco 2, 4, 8, 18	lb.	.14 /	.195
Welcoline	lb.	.21 /	.42
Plastone	lb.	.27 /	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485 /	.1703
Stearex Beads	lb.	.1488 /	.1588
Stearic acid			
Emersol 120	lb.	.1675 /	.1875
150	lb.	.1925 /	.2175
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.1225 /	.1475
Rufat 75	lb.	.1062 /	.1325
Single pressed, comml.	lb.	.1475 /	.1675
Emersol 110	lb.	.1625 /	.1875
Groco 54	lb.	.16 /	.185
Wilmar 253	lb.	.1525 /	.1775
Double pressed, comml.	lb.	.1525 /	.1725
Groco 54	lb.	.165 /	.19
Wilmar 254	lb.	.1575 /	.1825
Triple pressed, comml.	lb.	.175 /	.195
Groco 55	lb.	.1775 /	.2025
Wilmar 255	lb.	.1875 /	.2075
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.515 /	.605
Vimbra	lb.	.32 /	.385
Vulklor	lb.	.88 /	1.08
Wilmar 110	lb.	.17 /	.22
434	lb.	.1425 /	.1925
Zinc stearate, comml.	lb.	.39 /	.44

Antioxidants

AC-1	lb.	.37 /	.86
-5	lb.	1.49 /	1.63
AgeRite Alba	lb.	$2.40 /	$2.50
Gel	lb.	.70 /	.72
H. P.	lb.	.79 /	.81
Hipar	lb.	1.05 /	1.07
Powder	lb.	.57 /	.59
Age Resin	lb.	.88 /	.90
D	lb.	.57 /	.59
Spar	lb.	.57 /	.59
Stalite	lb.	.57 /	.59
S	lb.	.57 /	.59
Superlite	lb.	.57 /	.59
White	lb.	1.50 /	1.60
Akroflex C	lb.	.85 /	.87
CD	lb.	.79 /	.81
Albasan	lb.	.69 /	.73
Alcogard 354 Powder	lb.	1.50 /	1.52
Allied AA 1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.160
Aminox	lb.	.57 /	.62
Antioxidant 425	lb.	2.47 /	2.50
2246	lb.	1.50 /	1.53
Antisol	lb.	.23 /	.24
Antisun	lb.	.15 /	.51
Antox	lb.	.59 /	.61
Aranox	lb.	3.25 /	3.30
Betanox Special	lb.	.91 /	.96
B-L-E, -25	lb.	.57 /	.62
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55 /	.60
Catalin AC-5	lb.	1.49 /	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57 /	.59
Flexamine	lb.	.79 /	.84
Heliozone	lb.	.31 /	.32
Ionol	lb.	.91 /	1.65
Microflake	lb.	.20 /	.24
Naugawhite	lb.	.57 /	.62
NBC	lb.	1.55	
Neozone A	lb.	.64 /	.66
C	lb.	.86 /	.88
D	lb.	.57 /	.59
Nevastain A	lb.	.51 /	.61
B	lb.	.51 /	.70
Octamine	lb.	.57 /	.62
PDA-10	lb.	.46 /	.48
Perflectol	lb.	.61 /	.68
Permalux	lb.	2.25	
Polygard	lb.	.57 /	.62
Polylite	lb.	.55 /	.60
Protector	lb.	.26 /	.31
Rio Resin	lb.	.60 /	.62
Santoflex 35	lb.	.72 /	.79
75	lb.	1.01 /	1.03
AW	lb.	.71 /	.78
B	lb.	.52 /	.59
BX	lb.	.63 /	.70
DD	lb.	.57 /	.59
Santovar A	lb.	1.55 /	1.57
Santowhite Crystals, Powder	lb.	1.55 /	1.62
L	lb.	.57 /	.59
MK	lb.	1.25 /	1.32
Stabilite	lb.	.55 /	.59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof-713	lb.	.26 /	.31
Improved	lb.	.25 /	.30
Jr.	lb.	.22 /	.27
Tenamene 3	lb.	.91 /	1.05
Thermoflex	lb.	1.05 /	1.07
Tonox	lb.	.54 /	.59
Tysonite	lb.	.24 /	.247
Velvapex 51-250	lb.	.40 /	
V-G-B	lb.	.75 /	.80
Wing-Stay S, T	lb.	.55 /	.67
100	lb.	1.00 /	1.08
Zalba	lb.	1.10	
Zenite	lb.	.52 /	.54

Antiozonants

Eastozone 30, 31	lb.	1.05 /	1.09
32	lb.	1.70 /	1.72
Tenamene 30, 31	lb.	1.24 /	1.28
UOP 88, 288	lb.	1.05 /	1.07

Antiseptics

Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22 /	.30
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07 /	.09
Carbonate	lb.	.16	
Blowing Agent CP 1475	lb.	.32 /	.35
Celogen	lb.	1.95 /	2.00
50 C	lb.	1.01 /	1.07
Kempore R-125	lb.	1.95	
Opex R-125	lb.	.68 /	.72
Sodium bicarbonate	100 lbs.	2.55 /	3.85
Carbonate, tech.	100 lbs.	1.35 /	5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.76	
NDX	lb.	1.52	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00 /	9.00
Cover cement	gal.	2.50 /	4.00
Chemlok 201, 203	gal.	5.00 /	7.50
220	gal.	9.25 /	12.00
401	gal.	11.70 /	14.40

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

CLAREMONT
Flock

Toughens
RUBBER
FORMULATIONS

Of all the muscle-building ingredients used by plastics formulators and rubber compounders to develop specification - toughness, Claremont Cotton Fillers have proven the most satisfactory. Many, many millions of pounds of Claremont Fillers have already shared in making many more millions of plastic parts and rubber products functionally strong.
Available in several classification-grades from fine flock to macerated fabric pieces. Strict quality manufacturing controls assure uniformity.

CLAREMONT FLOCK CORPORATION
Write for Samples
The Country's Largest Manufacturer of FLOCK
CLAREMONT, NEW HAMPSHIRE

DPR®
DEPOLYMERIZED
RUBBER

NATURAL CRUDE RUBBER
IN LIQUID FORM
100% SOLIDS

AVAILABLE IN
HIGH and LOW VISCOSITIES

DPR, INCORPORATED
A Subsidiary of H. V. HARDMAN CO.
571 CORTLANDT STREET
BELLEVILLE 9, N. J.

DPR TRADE MARK

ROLL CAMBER ADJUSTED BY FABRIC EDGE GAGE
FOR PRECISE CONTROL OF WIDTH, CENTERING AND EDGE
CONDITION OF TIRE FABRICS AND OTHER OPEN WEAVES
DURING WEB PROCESSING . . . *Bulletin on Request*

C. A. LITZLER CO., INC.
1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"
EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

Chemlok 602	gal.	$25.00 /	$26.00
607	gal.	18.00 /	
614	lb.	4.35 /	4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52 /	5.10
SS-64	lb.	3.65 /	6.75
-67 Primer	lb.	7.50 /	12.50
Gen-Tac Latex	lb.	.70 /	.805
Hylene M	gal.	3.50 /	3.75
M-50	gal.	1.90 /	2.15
Kalabond Adhesive	gal.	6.50 /	16.00
Tie Cement	gal.	2.00 /	5.60
Thixons	gal.	1.48 /	12.00
Ty Ply, BN, Q, S, UP, 3640	gal.	6.75 /	8.00
RC	gal.	3.75 /	5.00

Brake Lining Saturants

BRT 3	lb.	.018 /	.0265
Resinex L-S	lb.	.0225/	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23 /	.30
Kosmos/Dixie BB	lb.	.23 /	.30
Spheron C	lb.	.18 /	.24
Voltex	lb.	.18 /	.315

Easy Processing Channel—EPC

Collocarb EPC	lb.	.059 /	.099
Continental AA	lb.	.074 /	.1225
Kosmobile 77/Dixiedensed 77	lb.	.074 /	.1225
Micronex W-6	lb.	.0725/	.145
Spheron #9	lb.	.0775/	.145
Texas E	lb.	.0775/	.145
Witco #12	lb.	.074 /	.1225
Wyex EPC	lb.	.0775/	.135

Hard Processing Channel—HPC

Continental F	lb.	.074 /	.1225
HX HPC	lb.	.074 /	.1225
Kosmobile S/Dixiedensed S	lb.	.074 /	.1225
Micronex Mk. II	lb.	.0775/	.145
Witco #6	lb.	.074 /	.1225

Medium Processing Channel—MPC

Arrow MPC	lb.	.0775/	.135
Continental A	lb.	.074 /	.1225
Kosmobile S-66/Dixiedensed S-66	lb.	.0775/	.145
Micronex Standard	lb.	.0725/	.145
Spheron #6	lb.	.0775/	.145
Texas 109	lb.	.084 /	.1475
M	lb.	.0775/	.145
Witco #1	lb.	.074 /	.1225

Conductive Furnace—CF

Aromex CF	lb.	.0875/	.145
Vulcan C	lb.	.11 /	.175
SC	lb.	.16 /	.245
XC-72	lb.	.25 /	.33

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0675/	.125
Continex FEF	lb.	.06 /	.10
Kosmos 50/Dixie 50	lb.	.06 /	.10
Philblack A	lb.	.0675/	.115
Statex M	lb.	.0625/	.125
Sterling SO	lb.	.0675/	.125

Fine Furnace—FF

Statex B	lb.	.0675/	.13
Sterling 99	lb.	.0725/	.13

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0775/	.135
Continex HAF	lb.	.079 /	.125
Kosmos 60/Dixie 60	lb.	.079 /	.1175
Philblack O	lb.	.0775/	.125
Statex R	lb.	.0725/	.135
Vulcan #3	lb.	.0775/	.135

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0925/	.15
Kosmos 70/Dixie 70	lb.	.10 /	.145
Philblack I	lb.	.0925/	.14
Statex 125	lb.	.0875/	.15
Vulcan 6	lb.	.0925/	.15

Super Abrasion Furnace—SAF

Philblack E	lb.	.115 /	.1625
Statex 160	lb.	.11 /	.18
Vulcan 9	lb.	.115 /	.18

General-Purpose Furnace—GPF

Arogen GPF	lb.	.06 /	.1175
Statex G	lb.	.055 /	.1175
Sterling V	lb.	.06 /	.1175
V Non-staining	lb.	.06 /	.1175

High Modulus Furnace—HMF

Collocarb HMF	lb.	.045 /	.085
Continex HMF	lb.	$0.055 /	$0.095
Kosmos 40/Dixie 40	lb.	.055 /	.095
Modulex HMF	lb.	.0625/	.12
Statex 93	lb.	.0575/	.12
930	lb.	.047 /	.087
Sterling L, LL	lb.	.0625/	.12

Semi-Reinforcing Furnace—SRF

Collocarb SRF	lb.	.042 /	.082
Continex SRF	lb.	.045 /	.085
Essex SRF	lb.	.0575/	.115
Furnex	lb.	.0525/	.115
Gastex	lb.	.0625/	.125
Kosmos 20/Dixie 20	lb.	.045 /	.085
Pelletex, NS	lb.	.0575/	.115
Sterling NS, S	lb.	.0575/	.115
R	lb.	.0625/	.125

Fine Thermal—FT

P-33	lb.	.0575	
Sterling FT	lb.	.0575	

Medium Thermal—MT

Sterling MT	lb.	.04	
Non-staining	lb.	.05	
Thermax	lb.	.04	
Stainless	lb.	.05	

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Colors

Black

Iron oxides, comml.	lb.	.1235/	.135
BK—Lansco	lb.	.1275/	.13
Williams	lb.	.145	
Lansco synthetic	lb.	.10	
Mapico pure synthetic	lb.	.1475/	.15
Lampblack, comml.	lb.	.16 /	.45
Superjet	lb.	.085 /	.12
Permanent Blue	lb.	.80 /	1.05
Stan-Tone	lb.	.45 /	1.20
Vansul masterbatch	lb.	.60 /	.65
Paste	lb.	.14 /	.15

Blue

Alkali Blue G, R	lb.	2.38	
C. P. Iran Blues	lb.	.52 /	.54
Du Pont	lb.	2.55 /	4.75
Filo	lb.	.28	
Heveatex pastes	lb.	.80 /	1.45
Lansco ultramarines	lb.	.25 /	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80 /	1.05
Stan-Tone Violet Blue			
D-4000	lb.	3.45	
4001	lb.	3.00	
4002	lb.	.90	
4900	lb.	1.97 /	2.15
Vansul masterbatch	lb.	.90 /	2.70

Brown

Filo	lb.	.13	
Iron oxides, comml.	lb.	.1425/	.145
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1575/	.16
Sienna, burnt, comml.	lb.	.0425/	.155
Williams	lb.	.115 /	.1775
Raw, comml.	lb.	.045 /	.1325
Williams	lb.	.08 /	.1725
Umber, burnt, comml.	lb.	.06 /	.07
Williams	lb.	.0725/	.085
Raw, comml.	lb.	.0625/	.07
Williams	lb.	.07 /	.0825
Williams, pure brown	lb.	.155	
Vandyke	lb.	.12	
Mapico Tan	lb.	.2325/	.235
Metallic brown pure synthetic	lb.	.05 /	.06
Vansul masterbatch	lb.	2.10 /	2.20

Green

Chrome	lb.	.19 /	.50
Green	lb.	.80 /	2.40
Oxide	lb.	.3925/	1.10
Cyanamid	lb.	.42 /	.44
Green G	lb.	3.00	
Lincoln Green	lb.	5.30 /	6.60
G-4099, -6099	lb.	.4525	
GH-9869	lb.	1.10 /	1.25
9976	lb.	1.20 /	1.35
Du Pont	lb.	2.05 /	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95 /	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	
Stan-Tone			
D-5000	lb.	3.95	
5001	lb.	.82	
5400	lb.	1.45	
Vansul masterbatch	lb.	2.00 /	2.60

Orange

Cyanamid Permatons	lb.	1.50 /	1.56
Du Pont	lb.	2.25	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone			
Light orange D-7003	lb.	3.97 /	4.17
70 PCO3	lb.	2.48 /	2.76
Orange 70 PCO4	lb.	2.80 /	3.08
D-7004	lb.	4.23 /	4.43
Stan-Tone Orange D-7104	lb.	$1.85 /	$2.05
Vansul masterbatch	lb.	2.00 /	2.60

Red

Antimony trisulfide	lb.	.285 /	.315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Brilliant Toning Red	lb.	1.95	
Cadmium red lithopones	lb.	2.21 /	3.77
Cadmolith	lb.	1.72 /	2.20
Cyanamid	lb.	.93 /	1.90
Naphthol Red, Scarlet	lb.	2.95 /	3.80
Du Pont	lb.	2.00 /	2.05
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml.	lb.	.06 /	.13
Lansco synthetic	lb.	.1175	
Mapico pure synthetic	lb.	.1425/	.145
Recco	lb.	.12	
Williams Red	lb.	.13 /	.1525
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Rub-Er-Red	lb.	.0975	
Stan-Tone			
D-2000	lb.	1.25	
2110, 2120, 2121	lb.	.98	
2200	lb.	1.47	
2500	lb.	1.90	
2600	lb.	4.60	
2601	lb.	1.60	
2700	lb.	1.75	
2800	lb.	1.90	
Light Red D-7005	lb.	4.68 /	4.88
D-7105	lb.	1.97 /	2.17
70 PCO5	lb.	3.00 /	3.28
Red D-7006	lb.	4.89 /	5.09
D-7106	lb.	2.20 /	2.40
70 PCO6	lb.	3.35 /	3.63
Vansul masterbatch	lb.	.95 /	3.30
Venetian	lb.	.04 /	.0675

White

Antimony oxide	lb.	.27 /	.285
Burgess Iceberg	ton	50.00 /	80.00
Cryptone BT	lb.	10 /	.11
Permolith lithopone	lb.	.08 /	.087
Titanium pigments			
Horse Head Anatase	lb.	.255 /	.27
Rutile	lb.	.275 /	.29
Rayox LW	lb.	.195 /	.205
R-110	lb.	.215 /	.225
Ti-Cal	lb.	.075 /	.0825
Ti-Pure	lb.	.195 /	.225
Titanox A, AA, A-168	lb.	.255 /	.265
C-50	lb.	.1438/	.1488
RA, -10, -50	lb.	.275 /	.285
RC	lb.	.0963/	.1013
-HT, -HTX	lb.	.0963/	.0988
Unitane	lb.	.255 /	.29
Zopaque Anatase	lb.	.245 /	.27
Rutile	lb.	.205 /	.29
Zinc oxide, comml.	lb.	.145 /	.1825
Azo ZZZ-11, -44, -55	lb.	.145 /	.165
20% leaded	lb.	.1505/	.1705
35% leaded	lb.	.155 /	.175
50% leaded	lb.	.1588/	.1788
Eagle AAA, lead free	lb.	.145 /	.155
5% leaded	lb.	.145 /	.155
35% leaded	lb.	.1513/	.1613
50% leaded	lb.	.1538/	.1638
Florence Green Seal	lb.	.1625/	.1725
Red Seal	lb.	.1575/	.1675
White Seal	lb.	.1675/	.1775
Horsehead XX-4, -78	lb.	.145 /	.155
Kadox-15, -17, -72, -515	lb.	.145 /	.155
-25	lb.	.1675/	.1775
Lehigh, 35% leaded	lb.	.1513/	.1613
50% leaded	lb.	.1538/	.1638
Protox-166, -167	lb.	.145 /	.155
St. Joe, lead free	lb.	.145 /	.175
Zinc sulfide, comml.	lb.	.253 /	.263
Cryptone ZS	lb.	.253 /	.263

Yellow

Cadmium yellow lithopones	lb.	1.12 /	1.15
Cadmolith	lb.	1.12 /	1.20
Cyanamid Hansa Yellow	lb.	2.20	
Du Pont	lb.	2.25	
Filo	lb.	.16	
Iron oxide, comml.	lb.	.0525/	.1175
Lansco synthetic	lb.	.1075	
Mapico pure synthetic	lb.	.12 /	.1275
Williams	lb.	.115 /	.1225
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb.	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone			
D-1100	lb.	2.55	
1101	lb.	.69	
Lemon 70 PCO1	lb.	1.77 /	2.19
D-7001	lb.	2.80 /	3.00
Medium yellow 70 PCO2	lb.	1.79 /	2.21
D-7002	lb.	2.98 /	3.18
Vansul masterbatch	lb.	.95 /	1.95
Williams Ocher	lb.	.0575/	.06

Dusting Agents

Diatomaceous silica	ton	32.00 /	48.00
Extrud-o-Lube, conc.	gal.	1.33 /	1.69

FOR LOW TEMPERATURE FLEXIBILITY / in synthetic & natural rubbers

RC PLASTICIZER

TG 8

Other RC Plasticizers for the rubber industry include ADIPATES, SEBACATES, DBP, BUTYL OLEATE, TG-9 and BD-8. WRITE FOR SAMPLES!

★ Superior Flex
★ Reduced Nerve
★ Low Volatile Loss
★ Smooth Extrusions

READY . . . RELIABLE . . . RC
SERVING AMERICAN INDUSTRY SINCE 1930

RUBBER CORPORATION OF AMERICA
New South Road, Hicksville 3, N. Y.
Sales Offices: NEW YORK • AKRON • CHICAGO • BOSTON

Maggie's DCIsion:

New Year's resolutions are often hard to keep, but your resolution to use DCI Magnesias in *ALL* your neoprene stocks is one that you will find easy, pleasant and profitable to keep. If you haven't tried DCI Magnesias, write for literature and samples. Start your magnesia year right.

DARLINGTON CHEMICALS, INC.

1420 Walnut St., Philadelphia 2, Pa.

Represented by • Summit Chemical Co., Akron
• Tumpeer Chemical Co., Chicago
• The B. E. Dougherty Co., Los Angeles and San Francisco

You make them
We road test them

On the most natural Proving Grounds in America—South Texas

This independent test fleet is located in Devine, Texas, some thirty-two miles southwest of San Antonio on U S Hiway 81. Sponsors have a choice of three routes from which to choose. Test procedures are flexible. Tire rotation, cycle miles, number and frequency of reports or routing, can be a basis for discussion if the sponsor so desires. We endeavor to operate to the best advantage of the sponsor. Because we are wholly independent of any organization, all information collected is responsible to the sponsor only.

Tires of all specifications tested—both passenger car and truck. Your inquiries will receive prompt attention.

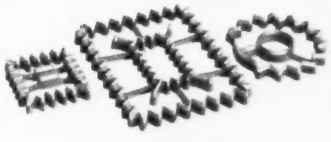
SOUTH TEXAS TIRE TEST FLEET, Inc.

Phone Morris 3-4428 DEVINE, TEXAS P. O. Box 353
A. J. (AL) Morrow, Pres. & Gen. Mgr.

EXPERIENCE... WE HAVE OVER 50 YEARS OF IT...

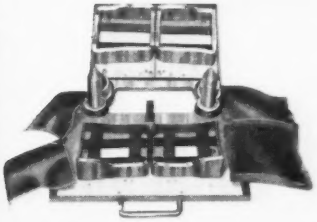
INDEPENDENT AND NEW ERA

Dies For Every Conceivable Purpose



CLICKER, WALKER PUNCH PRESS and MAUL HANDLE

DISTRIBUTORS FOR:
- Fales Clicker Machines and Seelye Beam Die Presses
- Hard Maple, Rubber, and Fibre Composition Die Blocks
- Rubber Pads
- Die Block Hardener
- Raw Hide Mauls



INDEPENDENT DIE & SUPPLY CO.

LA SALLE & OHIO STS. . . . ST. LOUIS 4, MISSOURI
Associate: NEW ERA DIE CO. Red Lion, York County, Pa.

Glycerized Liquid Lubricant, concentrated	gal.	$1.25	$1.63
Latex-Lube GR	lb.	0.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30	0.35
Lubrex	lb.	.25	.30
Mica, 160 Biotite	lb.	.065	.0725
Mesh	lb.	.08	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08	.09
Mineralite	ton	45.00	
Pyrax A	ton	14.50	15.00
W. A.	ton	17.00	17.50
Talc, comml.	ton	18.40	38.50
EM	ton	11.00	63.00
LS Silver	ton	29.25	
Nytals	ton	25.00	36.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19 75	
III	ton	20.75	
Vanfre	gal.	2.00	

Extenders

BRS 700	lb.	.02	.036
BRT 7	lb.	.035	.036
Cumar Resins	lb.	.065	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29	.36
Brown	lb.	.1425/	.263
Neophax	lb.	.157	.268
White	lb.	.144	.285
G. B. Asphaltenes	lb.	.097	.177
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38.00	40.00
Hard Hydrocarbon	ton	46.50	48.50
Hydrocarbon MR	ton	45.00	55.00
Parmr	ton	21.00	29.00
T-MR Granulated	ton	47.50	50.00
Nuba No. 1, 2	lb.	.0575/	.0625
3X	lb.	.0775/	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16	.2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.192	.2103
Stan-Shells	ton	35.00	73.00
Sublac Resin PX-5	lb.	.215	.235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex	lb.	.35	.475

Fillers, Inert

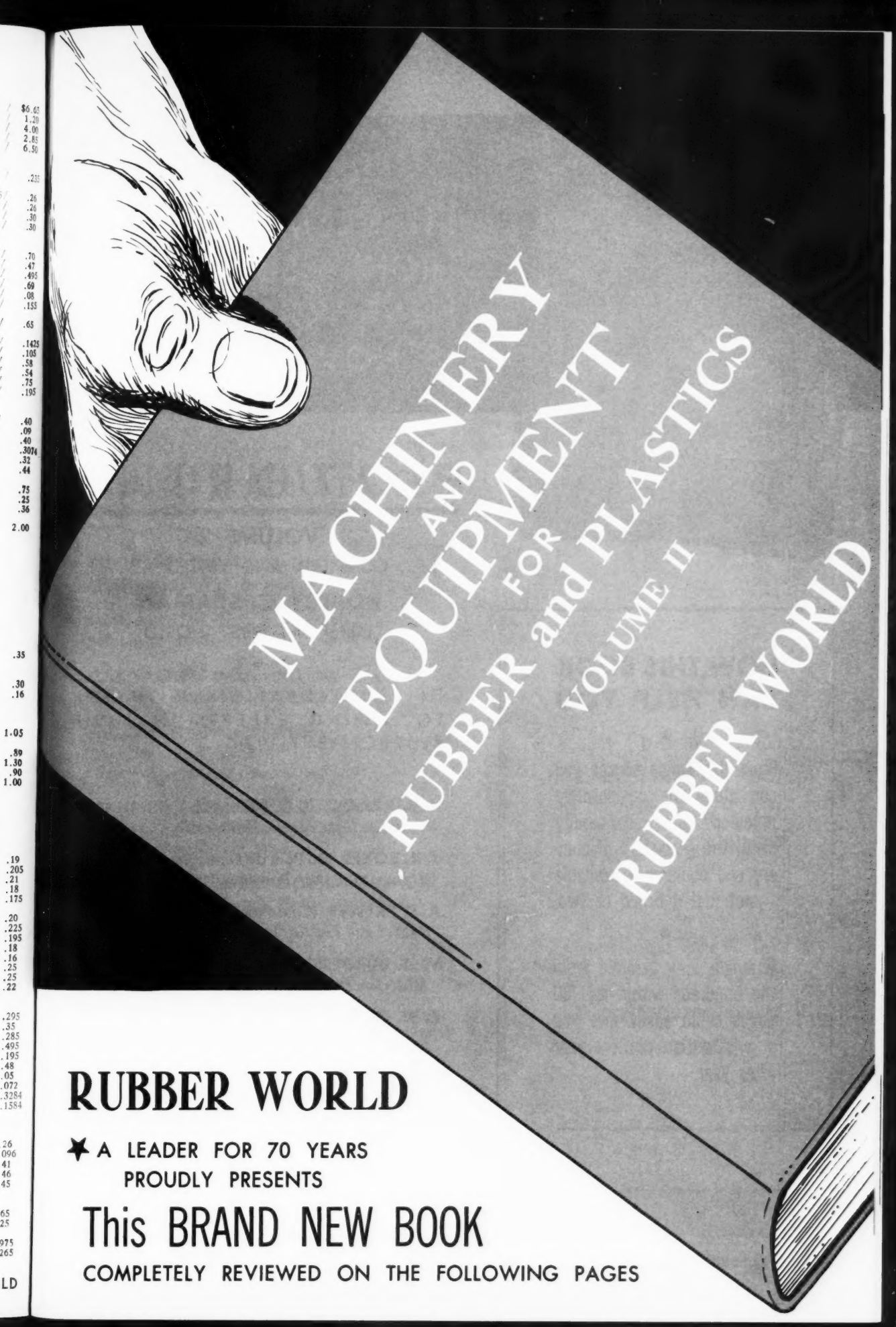
Agrashell flour	ton	50.00	74.00
Albacar	ton	55.00	75.00
Barytes, floated, white	ton	49.00	70.85
Off-color, domestic	ton	25.00	
No. 1	ton	55.00	77.50
2	ton	50.00	72.50
Sparmite	ton	95.00	117.00
Blanc fixe	ton	100.00	165.00
Burgess Iceberg	ton	50.00	80.00
Pigment #20	ton	35.00	60.00
#30	ton	37.00	60.00
HC-75	ton	12.00	30.00
-80	ton	14.00	32.00
WP #1	ton	11.00	16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays			
A. F. D. Filler	ton	29.50	36.00
Aiken	ton	14.00	
Albacar	ton	50.00	55.00
Aluminum Flake, coarse	ton	25.50	28.50
Fine	ton	29.50	36.00
#5	ton	27.50	34.50
Champion	ton	14.50	
Crown	ton	14.00	33.00
Dixie	ton	14.50	
Franklin	ton	13.50	35.25
GK Soft Clay	ton	11.00	
Harwick	ton	15.50	55.50
Hi-White R	ton	14.50	19.50
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
McNamee	ton	14.50	
RX-43	ton	33.00	
Natka 1200	ton	12.90	35.00
Par	ton	13.00	
Paragon	ton	14.50	19.50
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.50	19.50
Swanee	ton	12.50	
Windsor	ton	14.00	30.00
DC Silica	lb.	1.15	1.40
Diatomaceous silica	ton	32.00	48.00
Flocks			
Cotton, dark	lb.	.095	.135
Dyed	lb.	.55	.60
White	lb.	.13	.33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22	2.46
Kalite	ton	52.50	67.50
Lithopone, comml.	lb.	$0.075	$0.085
Astrolith	lb.	.068	.0675
Eagle	lb.	.0725/	.075
Permolith	lb.	.08	.0875
Sunolith	lb.	.075	.0825
Mica, 160 Biotite	lb.	.065	.0725
Mesh	lb.	.08	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08	.09
Millical	ton	38.00	53.00
Mineralite	ton	40.00	60.00
Non-Fer-Al	ton	35.00	50.00
Ohio Superspray lime	ton	10.50	
Pulverized limestone, Stonelite	ton	5.25	11.00
Purecal	ton	56.75	71.75
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Sawdust	ton	14.00	35.00
Silversheen Mica	lb.	.08	.09
StanWhite	ton	10.50	13.10
Super-White Silica	ton	25.00	46.50
Surfex	ton	37.50	52.50
MM	ton	42.00	57.00
Suspenso	ton	38.00	53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00	2.25
Walnut shell flours	ton	50.00	84.00
Whiting, limestone			
Atomite	ton	32.50	35.00
Calcite	ton	23.00	
Calwhite	ton	20.00	27.00
-T	ton	23.00	
Duramite	ton	20.00	
Gamaco	ton	32.50	40.00
Keystone	ton	20.00	22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00	16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14.50	22.50
Snowflake	ton	17.00	18.00
Witco	ton	13.00	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50	8.00
Flocks, Rayon, colored	lb.	.90	1.50
White	lb.	.75	1.25
Also see Flocks, under Fillers, Inert			
Paraffint RG and RGU Synthetic Wax	lb.	.15	.22
Rubber lacquer, clear	gal.	1.00	2.00
Shellacs, Angelo	lb.	.485	.7325
Vac Dry	lb.	.485	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15	.20
Wax, Bees	lb.	.68	.83
Carnauba	lb.	.57	1.13
Monten	lb.	.27	
No. 118, colors	gal.	.86	1.41
Neutral	gal.	.76	1.31
Van Wax	gal.	1.45	1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06	.075
FA #1	lb.	.065	.08
#2	lb.	.075	.09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00	1.15
-144	lb.	.15	.30
-307	lb.	1.10	1.25
-311	lb.	.60	.75
Aerosol, dry types	lb.	.65	.80
Liquid types	lb.	.40	.75
Alcogard 354	lb.	1.40	1.42
Alcogum AK-12	lb.	.12	.14
AN-6	lb.	.055	.06
-10	lb.	.09	.10
-25	lb.	.31	
PA-15	lb.	.16	
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675/	.18
Antifoam J-114	lb.	3.25	3.45
P-242	lb.	.24	.35
Antioxidant J-137, -140	lb.	.55	.70
-139, -293	lb.	1.45	1.60
-182	lb.	2.00	2.15
-186	lb.	1.40	1.55
2246	lb.	1.50	1.53
Anti Webbing Agent J-183	lb.	.75	.90
-297	lb.	.27	.40
Aquablak B	lb.	.0975/	.1025
G	lb.	.12	.125
K	lb.	.12	.125
M	lb.	.105	.11
Aquarex D	lb.	.78	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.33	
ME	lb.	.80	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.20	
Areskap 50	lb.	.30	.38
100, dry	lb.	.60	.72
Aresket 240	lb.	.30	.38
300, dry	lb.	.60	.72
Aresklene 375	lb.	.42	.57
Ben-A-Gels	lb.	.98	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40			
-300	lb.	1.00	1.17
CW-12		$0.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	5.45	$6.65
B	lb.	.68	1.20
Emulsion	lb.	2.05	4.00
AF Emulsion	lb.	2.05	2.85
Compound 7	lb.	5.13	6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
NDW	lb.	.215	.235
Dispersing Agents			
Blancol	lb.	.1525	.26
N	lb.	.155	.26
Darvan Nos. 1, 2, 3	lb.	.22	.30
Daxad 11, 21, 23, 27	lb.	.08	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50	.70
Igepal CO-630	lb.	.2875/	.47
Igepon T-73	lb.	.285	.495
T-77	lb.	.45	.69
Indulins	lb.	.06	.08
Kreelons	lb.	.132	.153
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52	.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225/	.1425
N	lb.	.095	.105
Modicols	lb.	.17	.58
Nekal BA-75	lb.	.395	.54
BX-76	lb.	.63	.75
Nopco 1287	lb.	.155	.195
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335	.40
Polyfons	lb.	.08	.09
Sorapon SF-78	lb.	.28	.40
Tergitol NPX	lb.	.275	.3074
TMN	lb.	.2875/	.32
7	lb.	.4125/	.44
Trenamine W-30	lb.	.15	
W-40	lb.	.60	.75
Triton R-100	lb.	.12	.25
X-100, -102, -114	lb.	.255	.36
Dispersions			
Agebest 1293-22	lb.	1.90	2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide, 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30	.35
P-33	lb.	.35	
Rotax	lb.	.75	
Sulfur	lb.	.12	.30
No. 2	lb.	.14	.16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.14	
Vulcacure NB	lb.	.45	
NS	lb.	.75	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85	.89
Vulcanizing, C group	lb.	.40	1.30
G group	lb.	.45	.90
N group	lb.	.40	1.00
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.04	
Ethyl, Methyl	lb.	1.04	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	.75	
Borden Arcco A-25, A-26, 716-30	lb.	.18	.19
555-40-R	lb.	.185	.205
620-32B	lb.	.20	.21
716-35	lb.	.17	.18
1041-21	lb.	.165	.175
Habuco Resin Nos. 502, 515, 523	lb.	.195	.20
503	lb.	.22	.225
504, 526	lb.	.19	.195
517	lb.	.175	.18
524	lb.	.155	.16
Resin A-2	lb.	.16	.25
P-370	lb.	.175	.25
X-210	lb.	.12	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Hyonic PE 250	lb.	.255	.295
Igepon T-43	lb.	.145	.35
T-51	lb.	.125	.285
-73	lb.	.285	.495
Ludox	lb.	.1675/	.195
Marmix	lb.	.41	.48
Merac	lb.	.75	1.05
Micronex, colloidal	lb.	.06	.072
Modical S	lb.	.3084	.3284
VD	lb.	.1384	.1584
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD 101	lb.	.16	.26
Picco Latex Plasticizer A-12	lb.	.069	.096
Pliolite Latex 150, 190	lb.	.32	.41
170	lb.	.37	.46
Polyvinyl methyl ether	lb.	.25	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44	.65
S	lb.	.13	.25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905	.975
30A	lb.	.245	.265

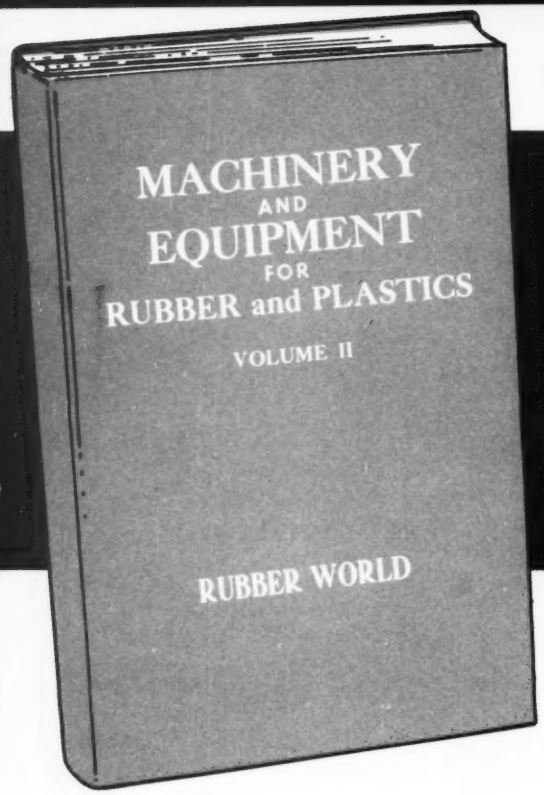


RUBBER WORLD

★ A LEADER FOR 70 YEARS
PROUDLY PRESENTS

This BRAND NEW BOOK

COMPLETELY REVIEWED ON THE FOLLOWING PAGES



VOLUME 2 SUPPLEMENTS THE HIGHLY SUCCESSFUL FIRST VOLUME—AND IS NOW AVAILABLE

EDITORIAL

VOLUME 2

COMPILED AND EDITED BY

ROBERT G. SEAMAN

Editor of RUBBER WORLD

•

IN COLLABORATION WITH THE FOLLOWING EXPERTS IN THEIR RESPECTIVE FIELDS:

•

H. B. ARRANS (U. S. Rubber Co.)
"Materials Handling . . . Footwear"

J. R. BOYER (Du Pont de Nemours)
"Mechanical Power Transmission"

A. F. BREWER (Consultant)
"Rubber and Plastic Mach. Lubrication"

W. T. BURGESS (U. S. Rubber Co.)
" Materials Handling . . . Rubber Goods"

E. W. GILCHRIST (Toledo Scale Co.)
"Weighing and Measuring"

L. G. GRIEBLING (Firestone T. & R. Co.)
"Production and Utilization of Steam"

Cont'd next page

HOW THIS BOOK CAN HELP YOU

•

From this single source you can study the comparative efficiency and adaptability of all the secondary machinery and equipment available — not just a brand or two.

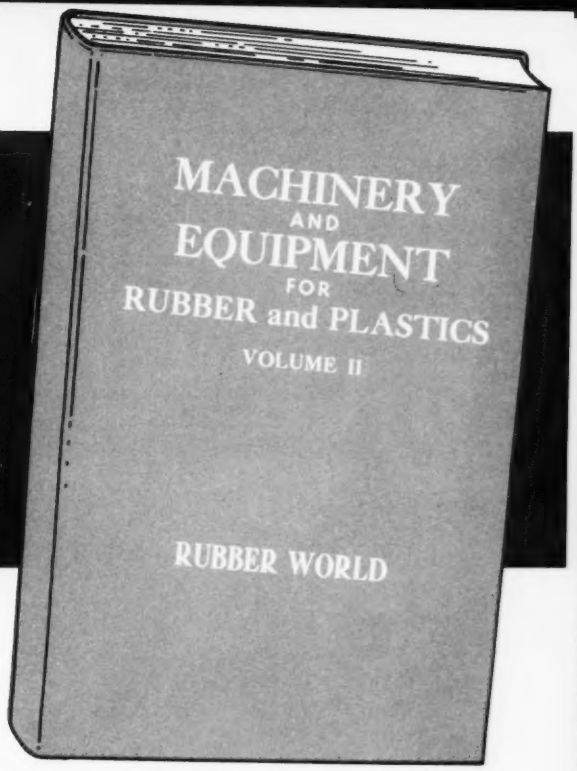
•

A single idea gleaned from the hundreds within its 700 pages could easily give you a substantial profit — year after year.

PUBLISHED BY—RUBBER WORLD—386 Fourth Ave., New York 16, N. Y.

Bill Brothers Publications: **Rubber World** • **Plastics Technology** • **Sales Management** • **Tide** • **Fast Food**

VOLUME 2
ANALYSIS AND USE OF OVER 500 ITEMS
364 ILLUSTRATIONS
–OVER 700 PAGES



CONTRIBUTORS

Cont'd from opposite page

T. H. KELLY (Bakelite Div. U. C. C.)
"Piping and Piping Specialties"

O. A. MARTIN (U. S. Rubber Co.)
"Materials Handling . . . Footwear"

R. D. SACKETT (Monsanto Chem. Co.)
"Materials Handling . . . Plastic Indust."

J. C. SMITH (Cornell University)
"Air Handling Equipment"
"Size Reduction and Separation"

MAURICE LOWMAN (Goodyear T. & R. Co.)
"Fabricating and Fininshing Molded, Extruded and Sponge Rubber Prod."

D. S. ULLOCK (Carbide & Carbon Chem. Co.)
"Pumps — Classification, Performance and Selection"

W. E. WELCH (Monsanto Chem. Co.)
"Decorative Treatments . . . Plastics"

•

VOL. 2 thoroughly covers the entire subject of secondary machinery and equipment. Information you often need — all in one handy, reliable book.

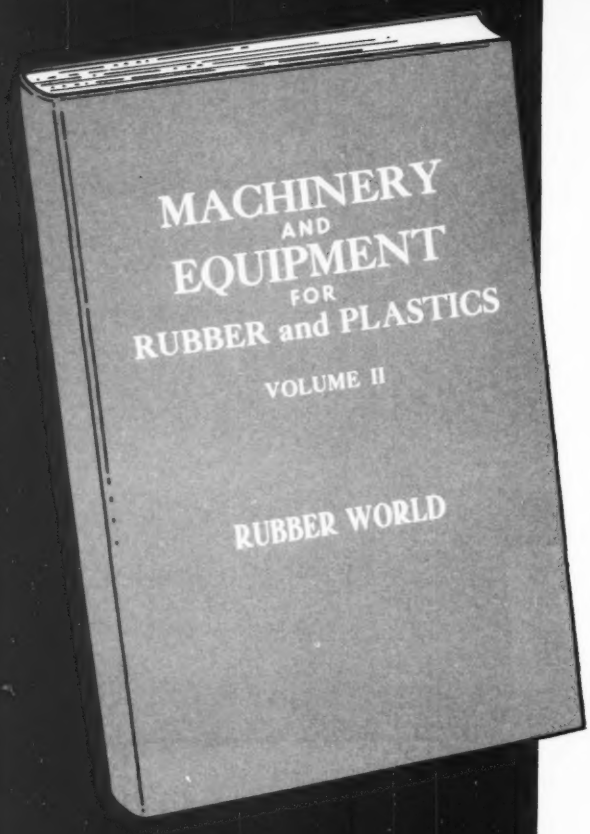
ON APPROVAL

Volume 2 is being sold with the understanding that it may be returned within 10 days — and your order cancelled.

•

Volume 1 was sold on that basis and not one of the 4000 books sold was returned to us — for any reason.

USE PURCHASE ORDER, LETTER or ORDER FORM — Next page



VOLUME 2

ELEVEN CHAPTERS ON THE FOLLOWING SUBJECTS

•

1—Weighing and Measuring
2—Handling and Storage
3—Valves and Piping
4—Pumps, Classification, Use
5—Air Handling Equipment
6—Size Reduction & Separation
7—Fabricating & Finishing
8—Decoration & Assembly
9—Power Transmission
10—Lubrication
11—Steam Generation & Use.

•

This time and money saving book was compiled by R. G. Seaman, Editor of Rubber World.

•

700 Pages: 364 Illustrations and Diagrams.

•

Cloth Bound; 6 x 9 inches.

Each subject is fully covered and carefully indexed for ready reference. In addition to hundreds of technical experts and makers of machinery and equipment, the editor had the valued cooperation of the experts listed on previous pages.

PLEASE FILL IN AND MAIL WITH REMITTANCE OR WE WILL BILL YOU

RUBBER WORLD
386 Fourth Avenue
New York 16, N. Y.

Date.....

Enclosed find $.....for which send postpaid.....copies of

"Machinery and Equipment for Rubber and Plastics," Volume 2.

Name .....

Firm .....

Street .....

City ..... State.....

$15.00 Postpaid in U.S.A.; $16.00 Elsewhere.
Order direct or through your book dealer.
(Money refunded if returned within 10 days—for any reason.

CLASSIFIED ADVERTISEMENTS

All Classified Advertising Must Be Paid in Advance

(No agency commission allowed except on display units)

GENERAL RATES	Light face type $1.50 per line (ten words) Bold face type $2.00 per line (eight words)
SITUATIONS WANTED RATES	Light face type 50¢ per line (ten words) Bold face type 70¢ per line (eight words)
SITUATIONS OPEN RATES	Light face type $1.25 per line (ten words) Bold face type $1.70 per line (eight words)

Allow nine words for keyed address.

Letter replies forwarded without charge, but no packages or samples.

ADDRESS ALL REPLIES TO NEW YORK OFFICE AT 630 THIRD AVENUE, NEW YORK 17, N. Y.

SITUATIONS WANTED

MANUFACTURING EXECUTIVE. GRADUATE ENGINEER, AGE 36, Married. Proven success with 17 years' experience in factory management, product development, compounding, machinery design, and production trouble shooting. Aggressive and full of initiative. Cost reduction through modern industrial engineering techniques. Languages. Responsible position with progressive manufacturer desired. Address Box No. 2282, care of RUBBER WORLD.

PLANT MANAGER, 20 YEARS' DIVERSIFIED EXPERIENCE IN molded, extruded, and dipped goods. Chemically blown, and all types of solid products. Good technical background. Know all types of machinery, processes, quality control, and cost reduction. Have fine record in all phases of management, including personnel, labor relations, and sales organization. Must relocate for family health reasons. Far West, or Southwest preferred, but South or East acceptable. Address Box No. 2283, care of RUBBER WORLD.

RESINS CONSULTANT

Consultant—High Temperature Resistant Resin Applications (Silicones, Epoxy, Phenolics, Polyesters, etc.) Also The Extrusion of Thermoplastics (Nylons, Acrylics, Vinyls, etc.) Southern California Area. Address Box No. 2284, care of RUBBER WORLD.

PRODUCTION MANAGER, WILL BE AVAILABLE TO SUPPLY know-how, 12 years' experience wide range chemical compounding, emulsion, solvent adhesives, plastic coatings, industrial paints. Good practical background, planning, scheduling, inventory control. Laboratory and technical sales experience. Résumé sent on request. Address Box No. 2285, care of RUBBER WORLD.

PLANT MANAGER—30 YEARS' EXPERIENCE IN MOLDED, extruded, chemical sponge. Rubber-to-metal adhesion. Good technical background including specification compounding experience. Address Box No. 2291, care of RUBBER WORLD.

FACTORY MANAGER—AGE 41, WITH 25 YEARS' EXPERIENCE hard rubber Compounding and Molding. 15 years' experience in supervision of all phases of operations. Desires position with a progressive organization. Address Box No. 2292, care of RUBBER WORLD.

SITUATIONS OPEN

INVESTIGATE SUNNY SOUTH CAROLINA

Research Director—Rubber and Resin Chemist, Ph.D. or equivalent. Mechanical Engineer, with rubber, plant engineering, design, and maintenance background. Send résumé today.

CONTINENTAL TAPES

Cayce, S. C.

FLOORING CHEMIST

Leading Flooring Manufacturer desires man with experience in rubber or vinyl flooring. Excellent opportunity in development and production. Salary commensurate with experience. Replies confidential. AMERICAN BILT-RITE RUBBER CO., Trenton 2, N. J., Attn. Mr. M. Smith.

SITUATIONS OPEN (Cont'd)

CHEMIST

To take charge of Laboratory, Quality Control, etc. Must be experienced in dry rubber compounding light-gravity stock. Good chance for advancement for right man. In replying, state experience, references, and salary expected. Address Box No. 2280, care of RUBBER WORLD.

TWO MANUFACTURERS AGENTS

One for Omaha and one for Denver to represent Custom Molded Rubber Company who can compound any type of rubber to customer specification. Exclusive territory—good commissions. Address Box No. 2281, care of RUBBER WORLD.

MAINTENANCE SUPERVISOR WANTED: Master mechanic to supervise maintenance and mechanical work in a New England small rubber plant. Give age, experience, references, and salary range. Address Box No. 2288, care of RUBBER WORLD.

RUBBER COMPOUNDER

Continued research effort has created an opportunity for a man with 10 years' experience in rubber formulation, molding, and extruding mechanical elastomers. Interest in applied research and product development essential. Our product lines include: adhesives, reinforced plastics, graphic products, tapes, coated abrasives, chemicals, insulating materials, recording tapes, and roofing granules. Location in St. Paul provides easy access to outstanding hunting and fishing areas. Age open. Salary commensurate with training and experience. Please write:

Technical Employment Manager
Minnesota Mining & Manufacturing Company
St. Paul 6, Minnesota

MACHINERY & SUPPLIES FOR SALE

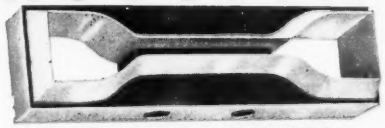
SURPLUS EQUIPMENT

4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.
1—Bolling 3-roll Laboratory Calender, 8" x 16".
2—Royle #½ Extruders, complete.
1—Banbury Midget Mixer with 2 HP gear motor.
1—Farrel-Birmingham 3-roll Lab Calender, 6" x 12".

Address Box No. 2286, care of RUBBER WORLD.

HYDRAULIC PRESSES, 2500-TON DOWNSTROKE 54" x 102". 325-ton upstroke 28" x 28". 300-ton upstroke 40" x 30". 300-ton upstroke 22" x 35". 250-ton French Oil upstroke 38" x 28". 140-ton 36" x 36" platens. 115-ton Farrel 24" x 24". Hartig 3¼" Plastic Extruder Electrically Heated. Adamson 6" Rubber Extruder. New & Used Lab. 6" x 13", 6" x 16", and 8" x 16" Mills and Calenders, & sizes up to 84". Baker-Perkins & Day Heavy-Duty Jack. Mixers up to 200 gals. Hydraulic Pumps & Accumulators, Rotary Cutters. Colton 5½ T, 4T & 3DT Preform Machines motor driven. Other sizes in Single-Punch & Rotary Pre-Form Machines. Banbury Mixers, Crushers, Churns, Tubers, Vulcanizers, Bale Cutters. Gas Boilers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 107 8TH STREET, BROOKLYN 15, NEW YORK. STERLING 8-1944.

HOGGSON

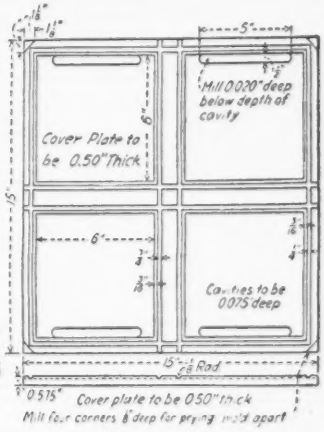


"DUMBBELL" Test Strip Die D412(51T)

TOOLS, MOLDS, DIES

For Rubber Testing and Production

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.


5"
Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
6"
Cavities to be 0.075 deep
SLAB→ MOLD D15-55
0.515" Cover plate to be 0.50" thick
Mill four corners ⅛" deep for prying mold apart

HOGGSON & PETTIS MFG. CO., 141S Brewery St., New Haven 7, Conn.

Pac. Coast: H. M. Royal, Inc., Downey, Calif.

Sequestrene ST	lb.	$0.585 /	$0.615
Setsit #5	lb.	.75 /	1.05
D #9	lb.	.85 /	1.15
Stablex A	lb.	.80 /	1.10
B, G	lb.	.50 /	.95
K	lb.	.27 /	.35
P	lb.	.35 /	.50
T	lb.	.14 /	.22
Surfactol 13	lb.	.345 /	.36
Vult-Accel E	lb.	.85 /	.92
Webnix	lb.	1.50 /	2.50

Mold Lubricants

Acintol D	lb.	.06 /	.75
A-C Polyethylene	lb.	.30 /	.47
Alipal CO-433	lb.	.25 /	.45
CO-436	lb.	.22 /	.41
Aquarex Compounds	lb.	.21 /	.94
Carbowax 200, 300, 400	lb.	.22 /	.25
1500	lb.	.255 /	.2825
4000	lb.	.31 /	.32
6000	lb.	.35 /	.36
Castorwax	lb.	.3375/	.3575
Colite Concentrate	gal.	.90 /	1.15
D-Tak Dip #10	gal.	1.50	
DC Mold Release Fluid	lb.	3.14 /	4.75
Compound 4, 7	lb.	5.13 /	6.50
Emulsion 7	lb.	1.20 /	1.74
8, 35, 35A, 35B, 36	lb.	1.20 /	1.74
200 Fluid	lb.	3.14 /	4.75
ELA	lb.	.82	
FT Wax 200	lb.	.265 /	.42
300	lb.	.295 /	.45
Glycerized Liquid Lubricant, concentrated	gal.	1.25 /	1.63
Igepals	lb.	.2875	.74
Igepon AP-78	lb.	.44 /	.68
T-43	lb.	.145 /	.35
-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Lubrex	lb.	.27 /	.32
Lubri-Flo	gal.	10.00 /	12.05
Lustermold	lb.	.41	
L-41 Diethyl Silicone Oil	lb.	3.50	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
MR-22	gal.	9.95 /	14.95
Para Lube	lb.	.046 /	.048
Paraflint RG and RGU Synthetic Wax	lb.	.15 /	.22
Plaskon 8406, 8407	lb.	.30 /	.37
8416, 8417	lb.	.35 /	.42
8429	lb.	.40 /	.47
Pluronics	lb.	.335 /	.44
Poly-Brite PE-200	lb.	.28 /	.42
600	lb.	.42 /	.58
Poly-Cone 125X	lb.	1.20 /	1.40
1000	lb.	.93 /	1.06
Polyglycol E series	lb.	.29 /	.42
RA-1, -2, -3	gal.	2.25 /	3.00
Rubber Glo	gal.	.94 /	.97
SM-33, -55, -61, -62	lb.	1.22 /	1.76
Soap, Hawkeye	lb.	1.35 /	1.45
Purity	lb.	.155 /	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20 /	1.25
800 series	gal.	1.26 /	1.70
900 series	gal.	1.55 /	2.55
A Series	gal.	1.80 /	4.50
Ucon 50-HB Series	lb.	.25 /	.375
Ulco	lb.	.12 /	.23
Vanfre	gal.	1.95 /	3.00

Odorants

Alamasks	lb.	.75 /	6.50
Coumarin	lb.	2.95 /	3.55
Curodex 19	lb.	4.75 /	5.05
188	lb.	5.75	
198	lb.	5.75	
Ethavan	lb.	6.75 /	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rodo	lb.	4.00 /	5.50
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00 /	3.15

Plasticizers and Softeners

Acintol R	lb.	.065 /	.07
Adipol 2EH, 10A, XX	lb.	.40 /	.435
BCA	lb.	.43 /	.455
ODY	lb.	.43 /	.465
Admex 710	lb.	325	
711	lb.	345	
744	lb.	340	
Aro Lene #1980	lb.	.10 /	.12
Baker AA Oil	lb.	.195 /	.24
Crystal O Oil	lb.	.21 /	.255
Processed oils	lb.	.215 /	.235
Bardol, 639	lb.	.0275/	.0375
B	lb.	.055 /	.065
Benzoflex 2-45	lb.	.26 /	.29
9-88	lb.	.27 /	.30
Bondogen	lb.	.555 /	.605
BRC-20	lb.	.022 /	.0245
22	lb.	.026 /	.0285
30	lb.	.0165/	.025
521	lb.	.023	
BRH 2	lb.	.0341/	.0351
BRS 700	lb.	.036	
BRT 7	lb.	.035 /	.036
BRV	lb.	.0625/	.065
Bunarex Liquid	lb.	.0425/	.0555
Resins	lb.	.065 /	.1225
Bunnatol G, S	lb.	.40 /	.505
Butac	lb.	.125 /	.135
Butyl stearate, comml	lb.	$0.255	
Binney & Smith	lb.	.23 /	$0.26
Harchem	lb.	.2525/	.3425
Kessoflex	lb.	.245 /	.275
Ohio-Apex	lb.	.245 /	.255
Butyl stearate—G. P.	lb.	.0125/	.02
R-100	lb.	.045 /	.0525
TT	lb.	.017 /	.02
Califlux G. P.	lb.	.015 /	.0225
R-100	lb.	.0475/	.0575
T-T	lb.	.019 /	.0295
510, 550	lb.	.0275/	.0375
Capryl alcohol, comml	lb.	.195 /	.235
Columbian Carbon	lb.	.195 /	.30
Harchem	lb.	.195 /	.30
Chlorowax 40	lb.	.1625/	.1825
70	lb.	.185 /	.245
S	lb.	.21 /	.27
Circo light	gal.	.17	
Circosol-2XH	gal.	.185	
Contogums	lb.	.0875/	.111
Cumar Resins	lb.	.065 /	.17
DBM (dibutyl-m-cresol) Darax	lb.	.32 /	.3475
DBP (dibutyl phthalate), comml	lb.	.30 /	.133
Darex	lb.	.30 /	.33
Eastman	lb.	.29 /	.335
Harflex 140	lb.	.30 /	.395
Harwick Std. Chem. Co.	lb.	.325 /	.385
Hatco	lb.	.30 /	.33
Monsanto	lb.	.30 /	.335
Naugatuck	lb.	.30 /	.33
Ohio-Apex	lb.	.30 /	.335
PX-104	lb.	.30 /	.33
Rubber Corp. of America	lb.	.30 /	.44
Sherwin-Williams	lb.	.30 /	.33
DBS (dibutylsebacate) comml	lb.	.66 /	.69
Eastman	lb.	.68 /	.71
Harflex 40	lb.	.655 /	.745
Hatco	lb.	.66 /	.685
Monoplex	lb.	.66 /	.675
Naugatuck	lb.	.665 /	.69
PX-404	lb.	.665 /	.69
DCP (dicaprylphthalate), comml	lb.	.295 /	.325
Harflex 180	lb.	.27 /	.36
Hatco	lb.	.295 /	.325
Monoplex	lb.	.30 /	.315
DDA (didecyladipate) Good-rite GP-236	lb.	.40 /	.55
Kessoflex	lb.	.40 /	.435
DDP (didecylphthalate) Good-rite GP-266	lb.	.295 /	.45
Hatco	lb.	.305 /	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate) Darex	lb.	.4325/	.4625
Eastman	lb.	.41 /	.44
Ohio-Apex	lb.	.41 /	.445
DIDA (diisodecyladipate) Monsanto	lb.	.40 /	.435
RC	lb.	.40 /	.54
DIDP (diisodecylphthalate) Darex	lb.	.32 /	.35
Harchem	lb.	.29 /	.385
Monsanto	lb.	.29 /	.325
Ohio-Apex	lb.	.29 /	.325
PX-120	lb.	.305 /	.335
RC	lb.	.29 /	.43
Dielex B	lb.	.06	
Diethylene glycol, comml	lb.	.1525/	.1825
Wyandotte	lb.	.15 /	.165
Dinopol IDO	lb.	.285 /	.32
DIOA (diisooctyladipate) Harflex 220	lb.	.40 /	.495
Kessoflex	lb.	.40 /	.435
Naugatuck	lb.	.435 /	.465
PX-208	lb.	.425 /	.455
Rubber Corp. of America	lb.	.40 /	.54
DIOP (diisooctylphthalate), comml	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.305 /	.335
Harflex 120	lb.	.28 /	.375
Hatco	lb.	.305 /	.335
Monsanto	lb.	.28 /	.315
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.28 /	.315
PX-108	lb.	.305 /	.335
Rubber Corp. of America	lb.	.28 /	.43
Sherwin-Williams	lb.	.32 /	.34
DIOS (diisooctylsebacate), comml	lb.	.61 /	.64
Rubber Corp. of America	lb.	.5925/	.70
DIOZ (diisooctylazelate) Cabflex	lb.	.48 /	.51
Dipolymer Oil	gal.	.33 /	.38
Dispersing Oil No. 10	lb.	.06 /	.0625
DNODA (di-n-octyl-n-decyl adipate), Monsanto	lb.	.40 /	.435
DOA (dioctyladipate), comml	lb.	.425 /	.455
Eastman	lb.	.40 /	.43
Good-rite GP-233	lb.	.40 /	.55
Harflex 250	lb.	.40 /	.495
Hatco	lb.	.435 /	.465
Monsanto	lb.	.40 /	.435
Naugatuck	lb.	.435 /	.465
PX-238	lb.	.425 /	.455
Rubber Corp. of America	lb.	.40 /	.54
DOP (dioctylphthalate), comml	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.28 /	.315
Good-rite GP-261	lb.	.285 /	.44
Harflex 150	lb.	.28 /	.375
Hatco	lb.	.305 /	.335
DOP (comml.) Monsanto	lb.	$0.28 /	$0.315
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.28 /	.315
Polycizer 162	lb.	.28 /	.435
PX-138	lb.	.305 /	.335
Rubber Corp. of America	lb.	.28 /	.43
Sherwin-Williams	lb.	.305 /	.335
DOS (dioctylsebacate), comml		.61 /	.64
Eastman	lb.	.61 /	.64
Harflex 50	lb.	.5925/	.6825
Hatco	lb.	.61 /	.635
Monoplex	lb.	.61 /	.635
Naugatuck	lb.	.615 /	.64
PX-438	lb.	.615 /	.64
Rubber Corp. of America	lb.	.5925/	.70
DOZ (di-2-ethylhexyl azelate) Kessoflex	lb.	.46 /	.48
Drapex 3.2	lb.	.40 /	.54
Dutch Boy NL-A10 (DBP)	lb.	.30 /	.33
-A20 (DOP), A30 (DIOP)	lb.	.305 /	.335
-A54	lb.	.295 /	.325
-C20 (DOS)	lb.	.61 /	.63
-F21	lb.	.395 /	.425
-F31	lb.	.44 /	.47
-F41	lb.	.48 /	.51
Dutrex 6	lb.	.025 /	.035
Dymerex Resin	lb.	.135 /	.1475
Elastex 36-R	lb.	.43 /	.4625
37-R	lb.	.70 /	.71
Emulphor EL-719	lb.	.52 /	.73
Endor	lb.	.67	
Ethox	lb.	.43 /	.455
Ethylene glycol, comml	lb.	.135 /	.165
Wyandotte	lb.	.1325/	.1425
Flexol 3 GH	lb.	.44 /	.46
3 GO	lb.	.53 /	.55
4 GO	lb.	.325 /	.355
10-A	lb.	.425 /	.455
426	lb.	.27 /	.30
810, 810X, 10-10, 10-10X	lb.	.305 /	.335
TOF A-26	lb.	.435 /	.465
Flexricin P-4	lb.	.3475/	.3625
P-6	lb.	.415 /	.43
P-8	lb.	.3475/	.3625
PG-16	lb.	.335 /	.35
Fortex	lb.	.125 /	.145
Fura-Tone NC 1008	lb.	.28	
1012	lb.	.46	
G. B. Asphaltic Flux	gal.	.097 /	.177
Naphthenic Neutrals	gal.	.125 /	.215
Process oil, light	lb.	.0275/	.0375
Medium	lb.	.0375/	.0475
Galex W-100	lb.	.155 /	.18
W-100 D	lb.	.1525/	.1775
Gilsowax B	lb.	.0975/	.11
Harchemex	lb.	.24 /	.345
Harflex 300	lb.	.58 /	.675
325	lb.	.4325/	.52
375	lb.	.7425/	.83
500	lb.	.315 /	.41
HB-20	lb.	.15 /	.17
-40	lb.	.19 /	.22
Heavy Resin Oil	lb.	.0225/	.0375
HSC-13	lb.	.25 /	.32
-39	lb.	.22 /	.29
Hycar 1312	lb.	.60	
Indonex	gal.	.13 /	.225
Kapsol	lb.	.33 /	.355
Kenflex A, L	lb.	.26 /	.27
B	lb.	.23 /	.24
N	lb.	.18 /	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.315 /	.325
-90	lb.	.40 /	.435
-140	lb.	.46 /	.485
-201	lb.	.58 /	.59
-220	lb.	.33 /	.365
-555	lb.	.59 /	.60
Kronisol	lb.	.33 /	.365
Kronitex AA, I, K-3, Mx	lb.	.325 /	.36
LX-685 -125, -135	lb.	.125 /	.135
Marvinol plasticizers	lb.	.28 /	.8825
Methox	lb.	.385 /	.41
Monoplex S-38	lb.	.215 /	.24
S-71	lb.	.45 /	.475
Morflex	lb.	.25 /	.65
Natac	lb.	.12 /	.13
Neoprene Peptizer P-12	lb.	1.05	
Nevillac	lb.	.31 /	.85
Neville R Resins	lb.	.145 /	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.50 /	.53
ODA (octyldecyladipate) Good-rite GP-235	lb.	.40 /	.55
Kessoflex	lb.	.40 /	.435
RC	lb.	.40 /	.54
ODP (octyldecylphthalate) Good-rite GP-265	lb.	.29 /	.445
Hatco	lb.	.305 /	.335
Rubber Corp. of America	lb.	.285 /	.43
Ohopex Q-10	lb.	.28 /	.315
R-9	lb.	.3525/	.3775
Orthonitro benzophenol, comml	lb.	.13 /	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185 /	.225
Panarez Resins	lb.	.09 /	.14
Para Flux, regular	gal.	.10 /	.2125
No. 2016	gal.	.165 /	.24
2332	gal.	.11	
4205	lb.	.1075/	.2125

MACHINERY & SUPPLIES FOR SALE (Cont'd)

FOR SALE: 3A BANBURY PRESENTLY IN PRODUCTION ON West Coast. Available for inspection. Address Box No. 2287, care of RUBBER WORLD.

FOR SALE: WORLD'S LARGEST STOCK OF SIGMA-BLADE Mixers: 43—Baker-Perkins #17, 200 gal., jacketed; 1—Baker-Perkins #15-USE, 100 gal., T304 SS, disp. blades, 75 HP; 3—W & P 50 gal., sigma, jacketed; 2—W & P 50 gal., non-jacketed; 2—Day 35 gal., sigma blade. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

FOR SALE: NEW 1957 MODEL NA-50, 50-TON DENISON Hydraulic Multipress with D-13 Dual Hand Control, 30 horsepower, 220/440 volt, 3-phase, 60-cycle motor. Reasonably priced. Less than 100 hours' usage. Full information upon request. The FAULTLESS RUBBER COMPANY, Ashland, Ohio.

FOR SALE: 1 BAKER PERKINS MIXER, 100 GAL. WORKING cap., size 15, fully jacketed, cored sigma blades, screw power tilt, chain motor drive. 1 Thropp Mill, 18" x 48", heavy-duty, top cap frame, 100 hp. motor drive. 2 Robinson Ribbon Blenders, 3000 & 6000 lbs. cap., geared-head motor drives. 1 SS Ribbon Blender, 600 lbs. cap. 2 Paterson Ball Mills, jacketed, 6' x 5' & 5' x 5', steel lined, ac. motor drives. 1 N.R.M. Extruder, 3½", 20-1 ratio, elect.-oil heated, variable speed drive. 1 Royle #2 Extruder, V-belt motor drive. Hydraulic Presses. Lab. Mills & Calenders. Stokes & Colton Tablet Presses. Grinders & Screens. KAHN EQUIPMENT CO., 1650 Coney Island Ave., B'klyn 30, N. Y. Tel: DEwey 6-4640.

HYDRAULIC PRESSES
2,000-ton 6-Opening PRESS. Platens 12" x 5'9".
3,000-ton 12-Opening PRESS. Platens 78" x 39" with Pumping Unit and loader.
No. 11. Banbury 2-speed Mixer. 535/370 HP motor drive.
34" x 22-3/16" x 26" HEAVY-DUTY MILL with 150 HP drive.
REED BROTHERS (ENGINEERING) LTD.
REPLANT WORKS
WOOLWICH INDUSTRIAL ESTATE.
LONDON W.E. 18.
Telegrams:—REPLANT LONDON S.E. 18.

FOR SALE: 2—20" x 22" x 60" RUBBER MILLS, 125 HP MOTOR; 5—Baker Perkins 100-gal. 15 JIM2, jacketed. Sigma blade Mixer; 1—#1 Ball & Jewell Rotary Cutter; Powder Mixers; Tablet Presses; Screens. Your inquiries solicited. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

FOR SALE: 36" MILL, 200-TON MOLDING PRESS, BALL MILLS, Sifters, Extruder, Banbury Mixer, Calender, Dicer, Granulators, B-P Mixer, 15 HP Boiler. UNIMAX CORP., 8200 Bessemer Ave., Cleveland 27, O.

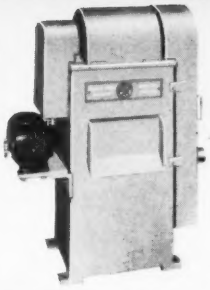
FOR SALE: 1—22" x 60" FARREL MILL, 150 HP; 1—16" x 48"—3-roll Farrel calender; 1—6" x 12" 3-roll Adamson calender; 1—4' x 12' vulcanizer, Q.-O. door; also presses, mixers, extruders, etc. CHEMICAL & PROCESS MACHINERY CORP., 52 Ninth Street, Brooklyn 15, N. Y.

FOR SALE: AT HOUSTON, TEXAS; ADAMSON 16 x 24" presses, 14" ram, four posts, single opening, 6¾" daylight, 150 tons @ 2000#. HOUSTON RUBBER MACHINE COMPANY, 3301 Jensen Drive, Houston 26, Texas.

MACHINERY & SUPPLIES WANTED

WANTED: 60" RUBBER OR PLASTICS MILL IN GOOD CONDITION. State manufacturer, size, type, accesories, location, and price. Write MARBON CHEMICAL, Div. Borg-Warner Corp., Box 68, Washington, W. Va. Attention Mr. B. Flood.

BLACK ROCK
Rubber Band Cutter

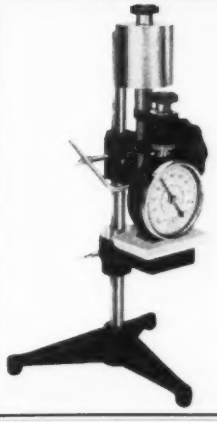


With one single setup you can cut infinitely variable band widths —from 1/16" to 1"— Adjustments can be made while your machine is in operation—600 to 800 cuts per minute.

COMPLETE LINE OF MACHINERY AND EQUIPMENT

WRITE TODAY

FINE BR TOOLS
BLACK ROCK MFG. CO.
179 Osborne Street • Bridgeport 5, Connecticut
NEW YORK OFFICE: 261 BROADWAY



RUBBER HARDNESS
ORIGINAL SHORE
DUROMETER
ASTM D676 AND ASTM D1484

Various models for testing the entire range of hardness from elastomeric to rigid. Available in quadrant or round dial case. May be used free hand or on table top OPERATING STAND WITH DEAD WEIGHT (left).

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 VAN WYCK EXP., JAMAICA 35, N.Y.

RMP
ANTIMONY
FOR
RED RUBBER

• ATTRACTIVE
• NON-DETERIORATING

RARE METAL PRODUCTS CO.
ATGLEN, PA.

BROCKTON TOOL COMPANY
Central Street
QUALITY MOULDS FOR ALL PURPOSES
South Easton, Mass.
THE FIRST STEP — A QUALITY MOULD

GUARANTEED REBUILT MACHINERY
IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
UNITED
HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

Patalube	lb.	$0.46 /	$0.48
Resins	lb.	.04 /	.045
Paradene Resins	lb.	.07 /	.08
Paraplex S-B	lb.	.29 /	.3475
Al-111	lb.	.32 /	.3275
G-25	lb.	.76 /	.77
-40	lb.	.4825/	.51
-50	lb.	.39 /	.4175
-53	lb.	.4325/	.46
-60	lb.	.325 /	.35
-62	lb.	.345 /	.37
RG-7	lb.	.33 /	.335
-8	lb.	.505 /	.5125
-10	lb.	.52 /	.5275
Peptizer 620	lb.	.37	
Peptizer 640	lb.	.42	
Pepton 22	lb.	.83 /	.86
65	lb.	1.23 /	1.26
65-B	lb.	.83 /	.86
Philrich 5	gal.	.11	
Picco Resins	lb.	.1275/	.22
480 Oilproof Series	lb.	.18 /	.23
Aromatic Plasticizers	lb.	.05 /	.065
Liquid Resin D-165 (V)	lb.	.06 /	.075
(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
S. O. S.	gal.	.29 /	.34
Piccocizers	lb.	.04	.055
Piccolastic Resins	lb.	.16 /	.25
Piccolyte Resins	lb.	.205 /	.245
Piccopale Resins	lb.	.12 /	.135
Piccovars	lb.	.165 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.30
Pigmentar	lb.	.046 /	.0634
Pigmentaroil	lb.	.046 /	.0634
Pitch, Burgundy, Sunny South	lb.	.1030/	.1085
Plasticizers			
42	lb.	.34 /	.40
84	lb.	.27 /	.305
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MP	lb.	.035 /	.0755
MT-511	lb.	.6925/	.7425
ODN	lb.	.35 /	.475
SC	lb.	.40 /	.515
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
DBE	lb.	.50 /	.55
MGB	lb.	.29 /	.37
SP-2	lb.	.43 /	.48
VS	lb.	.3575/	.3975
Plastogen	lb.	.0875/	.09
Plastone	lb.	.25 /	.32
Polycin 470	lb.	.325 /	.34
Polyclears	lb.	.28 /	.55
162	lb.	.285 /	.44
Polymel-C	lb.	.1775/	.1875
D	lb.	.225 /	.235
D-TAC	lb.	.1975/	.215
DX, C-130	lb.	.1375/	.1475
Poly-Sperse AP-2	lb.	.23 /	.295
AP-300	lb.	.26 /	.325
LC-20	lb.	.26 /	.325
R-100	lb.	.17 /	.325
PT Pine Tars	lb.	.038 /	.0554
101 Pine Tar Oil	lb.	.038 /	.0554
Reogen	lb.	.1425/	.145
Resin C pitch	lb.	.0225/	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325/	.0375
85, 100	lb.	.035 /	.04
115	lb.	.0375/	.0425
L-2, L-3, L-4, L-5	lb.	.0225/	.03
Rosin Oil, Sunny South	gal.	.58 /	.76
RPA No. 2	lb.	.85	
3	lb.	.51	
Conc.	lb.	.85	
5	lb.	.68	
6	lb.	1.66	
RSN Flux	gal.	.10 /	.91
Rubber Oil B-5	lb.	.0225/	.0355
Rubberol	lb.	.18 /	.2725
Santicizer 1-H	lb.	.50 /	.52
8	lb.	.44 /	.46
9	lb.	.42 /	.44
140	lb.	.325 /	.36
141	lb.	.34 /	.375
160	lb.	.265 /	.30
409	lb.	.39	
602	lb.	.285	
B-16	lb.	.4875/	.4975
E-15	lb.	.52 /	.55
Santocizer	lb.	.4275/	.4575
Sebacic acid, purified, comml.	lb.	.59 /	.65
Binney & Smith	lb.	.64 /	.76
C. P.- Binney & Smith	lb.	.72 /	.84
Harchem	lb.	.69 /	.89
Sherolatum Petroleum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675/	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.17 /	.2625
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.365 /	.40
Tributyl phosphate	lb.	.50 /	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml.	lb.	.33 /	.36
Monsanto	lb.	.325 /	.36
Naugatuck	lb.	.33 /	.36
PX-917	lb.	.33 /	.36
Triphenyl phosphate, comml.	lb.	.39 /	.40
Monsanto	lb.	.39 /	.40
Turgum S	lb.	$0.1075/	$0.1175
SB	lb.	.0675/	.0775
Turpol NC 1200	lb.	.61 /	.70
Tysonite	lb.	.3025/	.305
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	.0225/	.0325

Reclaiming Oils

Acintol C, P	lb.	.02 /	.03
Bardol, 639	lb.	.0275/	.0375
B	lb.	.055 /	.065
BRH 2	lb.	.0213/	.0351
BRT 3	lb.	.02 /	.031
4	lb.	.02 /	.031
7	lb.	.035 /	.036
BRV	lb.	.0625/	.065
Burco-RA	lb.	.053 /	.0805
BWH-1	lb.	.16 /	.18
Dipolymer Oil	gal.	.33 /	.43
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.115 /	.275
Heavy Resin Oil	lb.	.0225/	.0375
LX-572	gal.	.27 /	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23 /	.33
-869	gal.	.33 /	.43
-871	gal.	.34 /	.44
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.315
-42	gal.	.23 /	.33
D-4	gal.	.27 /	.37
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
PT 101 Pine Tar Oil	lb.	.038 /	.0554
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275/	.3975
-V	gal.	.30 /	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.0225/	.0325

Reinforcers, Other Than Carbon Black

Angelo Shellacs	lb.	.485 /	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18 /	.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
BRC-20	lb.	.0235/	.0245
22	lb.	.026 /	.0285
30	lb.	.0165/	.025
521	lb.	.023	
Bunarex Resins	lb.	.065 /	.1225
Cab-o-sil	lb.	.67 /	.85
Calcene CO	ton	105.00	
NC	ton	80.00 /	100.00
TM	ton	82.50 /	102.50
Calco S. A.	lb.	.85 /	.88
Clays			
Aiken	ton	14.00	
Aluminum Flake	ton	22.25 /	60.00
Buca	ton	45.00	
Burgess Iceberg	ton	50.00 /	80.00
Icecap K	ton	65.00 /	90.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.50	
Franklin	ton	13.50 /	35.25
L. G. B.	ton	17.50	
McNamee	ton	14.50	
Par	ton	15.00	
Paragon	ton	14.50 /	33.00
Pigment No. 33	ton	37.00	
Polyfil C	ton	25.00	
Recco	ton	14.00	
Suprex	ton	14.50 /	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175/	.1255
Cumar Resins	lb.	.065 /	.17
Darex Resins	lb.	.42 /	.49
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Good-rite 2007		.36 /	.38
2057		.30 /	.31
K Series Polymers	lb.	.15 /	.37
233	lb.	.08 /	.095
X303	lb.	.40 /	.45
Hi-Sil 233	lb.	.08 /	.095
X303	lb.	.40 /	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06 /	.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium carbonate, Marinco CL	lb.	.105 /	.135
Marbon Resins	lb.	.36 /	.43
Multifex MM	ton	117.50 /	137.50
Super	ton	167.50 /	187.50
Neville Resins			
465	lb.	.075 /	.08
LX-509	lb.	.33 /	.35
Nebony	lb.	.045 /	.05
Paradene	lb.	.07 /	.08
R	lb.	.145 /	.205
Para Resins 2457	lb.	.04 /	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.1275/	.22
Piccolyte Resins	lb.	.205 /	.275
Piccoumaron Resins	lb.	.07 /	.19
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	$0.98 /	$1.33
S-3	lb.	.42 /	.49
S-6	lb.	.36 /	.43
-6B	lb.	.36 /	.43
E	lb.	.36 /	.43
Plio-Tuf G85C	lb.	.52 /	.59
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00 /	125.00
U	ton	120.00 /	135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0375/	.0525
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	ton	110.00 /	130.00
L	lb.	.0575/	.0675
Silvacons	ton	55.00 /	85.00
Transphalt	lb.	.0375/	.0525
Witcarb P	ton	117.50 /	153.50
R	ton	127.50 /	163.50
Regular	ton	60.00 /	96.00
Zeolex 23	lb.	.055 /	.06
Zinc oxide, commercial†	lb.	.135 /	.1775

Retarders

Benzoic acid TBAO-2	lb.	.44	
E-S-E-N	lb.	.37 /	.39
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075/	.36
Retarder ASA	lb.	.57	
J	lb.	.68 /	.73
PD	lb.	.39 /	.41
W	lb.	.46	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.39 /	.41

Solvents

Bondogen	lb.	.555 /	.605
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	.37 /	.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD, Sunny South	gal.	.42 /	.63
Ethylene dichloride, comml.	lb.	.09 /	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsolv H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34
Penetrell	gal.	.42 /	.63
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-H	gal.	.148	
-R, -V	gal.	.139	
-C	gal.	.162	
Stauffer Carbon Disulfide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Tackifiers

Acintol R	lb.	.065 /	.07
Bardol, 639	lb.	.0275/	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.065 /	.17
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1625
Indopol H-35	gal.	.65 /	.84
H-50	gal.	.70 /	.89
-100	gal.	.85 /	1.08
-300	gal.	1.00 /	1.24
-1500	gal.	1.48	
L-10	gal.	.40 /	.59
-50	gal.	.45 /	.64
-100	gal.	.55 /	.74
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.12 /	.13
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.1275/	.22
Piccolastic Resins	lb.	.1855/	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.07 /	.185
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17 /	.2625
United	gal.	.69 /	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Dodecenyl succinic anhydride	lb.	.75 /	.76
HMDA-Carbamate	lb.	4.50 /	4.90
Ko-Blend I. S.	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
Maglite D, K	lb.	.235 /	.305
M	lb.	.2675/	.33
Marmag	lb.	.2225/	.2725
PSD 85	lb.	.37 /	.50

(Continued on page 616)

BUSINESS OPPORTUNITIES

IF YOU MOLD FOAM RUBBER RUBBER OR LATEX PRODucts, and could arrange a branch enterprise for a wonderful new comfort invention, on a full or split franchise basis; if you see many conflicting duplications, too many of same commodities crowding markets, and appreciate progressive attitude, explain your set-up, and allow me to tell you about one of the greatest discoveries of the present age! Address Box No. 2289, care of RUBBER WORLD.

EXECUTIVE WITH EXTENSIVE PRODUCTION, COMPOUNDing, research, product development, customer contact, and all phases of rubber manufacturing wishes to invest a small sum in a rubber plant. Would like to direct production and assume partial ownership. Address Box No. 2290, care of RUBBER WORLD.

MIXING

To Your Specification

K. B. C. INDUSTRIES, INC. **NEW HAVEN, CONN.**

881 State Street Tel: State 7-5662

Otto J. Lang, General Manager

For Plastisols

...LOOK TO Borden

ROTATIONAL CASTING • SLUSH MOLDING
DIPPING • COATING • LAMINATING

Approved formulations for these and other uses. Samples prepared to meet your specifications.

For information write or phone The Borden Company, Chemical Division, Coatings & Adhesives Dept. RW-19, 103 Foster Street, Peabody, Massachusetts; or to Borden plants in Chicago, Illinois; Middlesex, New Jersey; or Toronto, Canada.

Adhesives, Coatings, Resin Emulsions, Hot Melts, Binders, Sizes and Saturants

IF IT'S A Borden Chemical IT'S GOT TO BE GOOD!

TO HAVE YOUR COPY OF
RUBBER WORLD
ON YOUR DESK WHEN NEEDED

Subscription Postpaid

United States	$5.00
Canada	6.00
All Other Countries	7.00

Single Copy, 50 Cents in U. S. 60 Cents Elsewhere

The World's Rubber Progress Every Month

RUBBER WORLD

FOUNDED 1889

630 THIRD AVENUE, NEW YORK 17, N. Y.

CONSULTANTS & ENGINEERS

HALE & KULLGREN, INC.

Specialists in Processes and Plants for Rubber and Plastics
A Complete Engineering Service
including: Economic Surveys; Process Design;
Installation; Contracting and Operation.
613 E. Tallmadge Ave., Akron 10, Ohio Franklin 6-7161

Where the Compounding and Engineering Problems of the Manufacturer may be solved.

SOFTENERS and PLASTICIZERS

for Rubber from the Pine Tree

GALEX® a non-oxidizing rosin now in pelletized form

Rosin Oil — Send for our GALEX Brochure and PINE TREE PRODUCTS Brochure — Pine Tar Dept. 50

NATIONAL ROSIN OIL PRODUCTS, Inc.

Americas Bldg., Rockefeller Center, 1270 Ave. of the Americas, New York 20
Refinery: Savannah, Ga. — Branches in Principal Cities

PIONEERS OF THE INDUSTRY

50 YEARS of Producing

*** MICA**

WATERGROUND WHITE and BIOTITE

PURELY A DOMESTIC PRODUCT

Lowest priced . . . from our own larger source.

A more uniform Mica . . . preferred in the Rubber Industry for many years.

The English Mica Co.

STERLING BUILDING · STAMFORD, CONN.

FOR PEQUANOC

CUSTOM COMPOUNDS

CALL

AMERICAN HARD RUBBER

All the know-how of the former Pequanoc Rubber Company *plus* one hundred and eight years of rubber processing experience behind American Hard Rubber Company.

- Expert compounding and milling of all grades of soft and hard rubber.
- Top technical assistance.
- High quality, uniform, controlled mixing.

AMERICAN HARD RUBBER COMPANY

Sales Division: Ace Road, Butler, N. J.
Phone: Butler 9-1000
Plants: Taftapoosa, Ga.; Butler, N. J.

Synthetic Rubbers and Latices*

Monomers

11-80, 100, 200, 112-3 Triols	lb.	$0.255	
11-300	lb.	.265	
11-400	lb.	.325	
Acrylonitrile	lb.	.27	
Butadiene	lb.	.15	
Dow Styrene N99, H99	lb.	.205	
RG	lb.	.17	
Vinyltoluene	lb.	.17	
EGD	lb.	1.75 /	$2.00
Hylene M	lb.	1.75 /	3.25
M-50	lb.	1.00 /	2.50
T	lb.	.95 /	2.50
TM	lb.	.80 /	2.35
-65	lb.	.85 /	2.40
Isobutylene	gal.	.38	
Isoprene	lb.	.25	
Mondur-C	lb.	1.05	
Monomer MG-1	lb.	1.00 /	1.25
-S	lb.	.85	
MPL	lb.	1.75 /	2.00
Multron R-2	lb.	.54	
P200	lb.	.23	
Rohm & Haas ethyl acrylate	lb.	.34 /	.36
Glacial methacrylic acid	lb.	.45 /	.47
Methyl acrylate	lb.	.37 /	.39
Methacrylate	lb.	.29 /	.31

Shortstops

DDM	lb.	.88 /	.915
Mercaptan 174	lb.	.38 /	.50
Sharstop	lb.	.33 /	.37
268	lb.	.52 /	.53
Tecquinol	lb.	.825 /	.845
Thiostop K	lb.	.50 /	.53
N	lb.	.38 /	.47
Vulnapol KM	lb.	.52 /	.55
NM	lb.	.38 /	.42
Wingstop B	lb.	.38	

Acrylic Types

Acrylon BA-15	lb.	1.25[a]	
EA-5	lb.	1.00[a]	
Hycar 4021	1.34[e] /	1.35[c]	

Latices

Hycar 2600X30, 2600X39, 2601	lb.	.50 /	.56

Fluorocarbon Types

Kel-F Elastomer	lb.	15.00 /	16.00
5500, 820 (Latex)	lb.	15.00 /	17.15
Viton A, AHV	lb.	15.00	

Isobutylene Types

Enjay Butyl 035, 150, 215, 065 217, 218,			.23[a]
325, 165, 268, 365			.24[a]
Hycar 2202		.65[e] /	.75[c]
Polysar Butyl 100, 200, 300, 400			.245[c]
101			.2775[a]
301			.255[c]
Vistanex LM			.45[a]
MM			.35[a]

Neoprene Types (CR)

Neoprene Type AC, AD, CG			.55[a]
GN, GN-A, WX			.41[a]
GRT, S			.42[a]
KNR			.75[a]
W, WHV			.39[a]
WRT			.45[a]

Latices

Neoprene Latex 571, 842-A			.37[a]
572			.30[a]
60, 601-A			.40[a]
635			.41[a]
650		.42[a] /	.53[a]
735, 736			.38[a]
750		.39[a] /	.50[a]
950			.47[a]

Nitrile Types

Butaprene NF			.49[b]
NH			.65[b]
NL			.50[b]
NXM			.58[b]
Chemigum N1NS			.64[b]
N3NS, N5			.58[b]
N6, N-6B, N7, N8			.50[b]
N600			.50[b]
Hycar 1001, 1041		.58[e] /	.59[a]
1002, 1042, 1043, 1052, 1053, 1312		.50[e] /	.51[c]
1014		.60[e] /	.61[c]
1072		.64[e] /	.65[c]
1411		.62[e] /	.63[c]
1432, 1441		.59[e] /	.60[c]
Paracril AJ			.485[c]
B, BJ, BJLT, BLT			.51[c]
C, CLT			.59[c]
CV			.60[c]
D			.65[c]
18-80			.60[c]
Polysar Krynac 800, 802, 803			.50[c]
801			.58[c]

Latices

Butaprene N-300			$0.46[b]
N-400, N-401			.54[b]
Chemigum 200			.49[b]
235 CHS, 236			.54[b]
245 B, 245 CHS, 246, 247, 248			.46[b]
Hycar 1512, 1552, 1562, 1577		$0.46[e] /	.52[c]
1551, 1561, 1571		.54[e] /	.60[c]
1852		.46[e] /	.52[c]
Nitrex 2612, 2614			.46[a]
2615			.51[a]

Polyethylene Type

Hypalon 20, 30	lb.		.70

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33			.96[a]
-8			1.35[a]
-205			4.00[a]
Type-A			.50[a]
FA			.69[a]
ST			1.25[a]

Latices

Thiokol Latex (dry wt.)			
Type MX			.80[a]
WD-2			1.25[a]
-6		.80[a] /	1.25[a]

Silicone Types

GE (compounded)		2.29[e] /	4.90[c]
Silicone gum (not compounded)		3.85[e] /	4.55[c]
Silastic (compounded)		2.95[b] /	3.50[b]
(Partly compounded)		3.15[b] /	3.60[b]
(Uncompounded)		4.05[b] /	4.35[b]
LS-53		18.00 /	24.00[b]
Union Carbide (compounds)		2.35[b] /	3.20[b]
(Gums)		3.85[b] /	4.25[b]

Styrene Types

Hot SBR†

Ameripol 1000, 1001, 1006, 1007		.241[e] /	.247[e]
1006 Crumb		.2475[e] /	.2535[c]
1002		.2435[e] /	.2495[c]
1009		.2475[e] /	.2535[c]
1011		.2475[e] /	.2610[a]
1012		.2425[e] /	.2485[c]
Crumb		.254[c] /	.26[c]
1013		.25[e] /	.2560[c]
ASRC 1004, 1006, 1009		.241[e] /	.2475[e]
1018			.270[e]
1019			.265[e]
FR-S 1000, 1001, 1004, 1006		.241[e] /	.247[e]
1009		.2475[e] /	.2535[e]
1010		.26[e] /	.266[e]
1012		.2425[e] /	.2485[e]
1013		.25[e] /	.256[e]
1014		.281[e] /	.287[e]
Naugapol 1016, 1019			.265[b]
1018			.27[b]
1021			.30[b]
1022			.28[b]
1023			.285[b]
Philprene 1000, 1001, 1006			.241[b]
1009			.2475[b]
1010			.26[b]
1018			.27[b]
1019			.265[b]
Plioflex 1006		.241[e] /	.247[e]
Polysar S, S-50			.241[e]
S-X-371			.255[e]
S-1001, -1006, -1013			.23[a]
-1002, -1011			.2325[a]
-1009			.24[a]
Synpol 1000, 1001, 1006, 1007, 1061			.241
1002			.2435[b]
1012			.2425[b]
1009			.2475[b]
1013			.25[b]

Hot SBR Black Masterbatch

Philprene 1100			.194
1104			.190[b]
S-1100			.185[a]

Cold SBR

Ameripol 1500, 1501, 1502		.241[e] /	.247[e]
ASRC 1500, 1502			.241[e]
1503			.2625[e]
Copo 1500, 1502		.241[e] /	.247[e]
1505		.261[e] /	.267[e]
FR-S 1500, 1502		.241[e] /	.247[e]
Naugapol 1503			.2625[b]
1504			.295[b]
Philprene 1500, 1502			$0.241[b]
1503			.2625[b]
Plioflex 1500, 1502			.241[b]
Polysar Kryflex 200			.231[a]
SS-250, SS-250-Flake			.2875[a]
Krylene, NS			.241[a]
S-1500, S-1502-S			.23[a]
S-1506			.25[a]
Synpol 1500, 1502, 1551			.241[b]

Cold SBR Black Masterbatch

Baytown 1600, 1601, 1602			.193[b]
Philprene 1600, 1601			.193[b]
1605			.19[b]
S-1600, -1601, -1602			.1825[a]

Cold SBR Oil Masterbatch

Ameripol 1703		$0.206[e] /	.212[c]
1705		.2035[e] /	.2095[c]
1707, 1708		.191[e] /	.197[c]
1710, 1712		.1885[e] /	.1945[c]
ASRC 1703			.206[e]
1708			.191[e]
Copo 1712		.1885[e] /	.1945[c]
1773		.206[e] /	.212[e]
1778		.191[e] /	.197[e]
FR-S 1703		.206[e] /	.212[e]
1712		.1885[e] /	.1945[c]
Philprene 1703			.206[b]
1706			.203[b]
1708			.191[b]
1710, 1712			.1885[b]
Plioflex 1703, 1773		.206[e] /	.212[c]
1710, 1712			.1885[c]
1778		.191[e] /	.197[c]
Polysar Krynol 651			.1885[c]
652			.191[e]
S-1703			.195[a]
-1706			.1925[b]
-1707			.18[a]
-1709, -1712			.1775[a]
Synpol 1703			.206[b]
1707, 1708			.191[b]
1711			.19[b]
1712			.1885[b]

Hot SBR Latices

FR-S 2000, 2001		.2725[e] /	.3425[c]
2002, 2003, 2004		.35[e] /	.36[e]
2006		.29[e] /	.382[c]
Naugatex 2000, 2001, 2006			.263[a]
2002			.288[a]
2005			.30[a]
Pliolite Latex 2000, 2001			.2825[a]
2076			.295[a]
Polysar Latex II			.29[a]
IV			.2775
S-2000			.2275[a]
2006			.215[a]

Cold SBR Oil-Black Masterbatch

Baytown 1801			.176[b]
Philprene 1803			.174[b]
S-1803			.165[a]
-1804			.175[a]

Cold SBR Latex

Copo 2101, 2108		.30[e] /	.4025[c]
2102, 2105, 2110		.32[e] /	.3725[c]
FR-S 2105			.366[e]
Naugatex 2101			.285[a]
2105			.312[a]
X-767			.323[a]
Polysar Latex 721			.32[c]
Pliolite Latex 2101			.30[a]
2105, 2107			.32[a]
2108			.30[a]
S-2101			.225
-2105			.31[a]
-2107			.32[a]

Cold BR Latex‡

Pliolite Latex 2104			.325[c]

[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
* Prices are per pound carload or tank-car dry weight unless otherwise specified.
†SBR—Styrene-butadiene rubber.
‡BR—Butadiene rubber.

Compounding Ingredients

(Continued from page 614)

Red Lead (*See Accelerator-Activators, Inorganic*)			
Sulfasan R	lb.	$1.55 /	$1.57
Sulfur flour, comml	100 lbs.	2.55 /	3.30
1018	lb.	.12 /	.1575
Aero	100 lbs.	2.40 /	7.75
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.65 /	4.55
Stauffer	lb.	.0265/	.054
Telloy	lb.	2.75	
VA-7	lb.	.50 /	.60
Vandex	lb.	7.50	
Vultac No. 2	lb.	.47 /	.74
3	lb.	.51 /	.78
White lead silicate (*See Accelerator-Activators, Inorganic*)			

Index to Advertisers

This index is maintained for the convenience of our readers. It is not part of the advertisers' contract, and RUBBER WORLD assumes no responsibility to advertisers for its correctness.

A

Adamson United Co. ..... —
Aetna-Standard Engineering Co. ..... —
American Cyanamid Co.:
Pigments Division 589
Rubber Chemicals Dept. 597
American Hard Rubber Co. 615
American Synthetic Rubber Corp. ..... —
American Zinc Sales Co. ..... —
Amoco Chemicals Corp. ..... —

B

Black Rock Mfg. Co. 613
Bolling, Stewart, & Co., Inc. 524
Borden Chemical Co., The
A Division of The Borden Co. 615
Brockton Tool Co. 613
Brooklyn Color Works, Inc. ..... —

C

Cabot, Godfrey L., Inc. ..... Back Cover
Carter Bell Mfg. Co., The 601
Cary Chemicals, Inc. 500
Claremont Flock Corp. 603
CLASSIFIED ADVERTISEMENTS .. 611, 613, 615
Cleveland Liner & Mfg. Co., The 518
Columbia-Southern Chemical Corp. 519
Columbian Carbon Co. ..... Insert 555, 556
Mapico Iron Oxides Unit 594
CONSULTANTS & ENGINEERS 615
Continental Carbon Co. ..... —
Continental Machinery Co., Inc. ..... —
Copolymer Rubber & Chemical Corp. 517

D

Darlington Chemicals, Inc. 605
Diamond Alkali Co. ..... —
Dow Corning Corp. 514, 515
DPR Incorporated, A Subsidiary of
H. V. Hardman Co. 603
du Pont de Nemours, E. I. & Co.
Second Cover
Durez Plastics Division
Hooker Chemical Corp. 502

E

Eagle-Picher Co., The 601
Eastman Chemical Products, Inc. ..... —
English Mica Co., The 615
Enjay Co., The 587
Erie Foundry Co. ..... —

F

Falls Engineering & Machine Co., The .. —
Farrel-Birmingham Co., Inc. 521
Ferry Machine Co. ..... —
French Oil Mill Machinery Co., The ..... —

G

Gammeter, W. F., Co., The ..... —
General Latex & Chemical Corp. 566
General Tire & Rubber Co., The
(Chemical Division) 513
German-American Trade Promotion Office 516
Glidden Co., The
(Chemicals, Pigments, Metals Division) —
Goodrich, B. F., Chemical Co. 487
Goodrich-Gulf Chemicals, Inc. 581
Goodyear Tire & Rubber Co., Inc., The
(Chemical Division) ..... Insert 495-498

H

Hale & Kullgren, Inc. 615
Hall, C. P., Co., The 492
Harchem Division, Wallace & Tiernan, Inc. 494
Harwick Standard Chemical Co. 523
Hoggson & Pettis Mfg. Co., The 611
Holmes, Stanley H., Co. 592
Hooker Chemical Corp.,
Durez Plastics Division 502
Houdry Process Corp. 505
Huber, J. M., Corp. 530

I

Iddon Brothers, Ltd. ..... —
Independent Die & Supply Co. 605
Industrial Ovens, Inc. ..... —
Institution of the Rubber Industry ..... —

J

Johnson Corp., The ..... —

K

K. B. C. Industries, Inc. 615
Kessler Chemical Co., Inc. 516

L

Liquid Carbonic, Division of
General Dynamics Corp. ..... —
Litzler, C. A., Co., Inc. 603

M

Mapico Iron Oxides Unit
Columbian Carbon Co. 594
Marbon Chemical Division of
Borg-Warner Corp. 527
Mast Development Co., Inc. ..... —
Merck & Co., Inc.
Marine Magnesium Division ..... —
Morris, T. W., Trimming Machines ..... —
Motch & Merryweather Machinery Co., The,
Wink Cutter Division ..... —
Muehlstein, H., & Co., Inc. 491

N

National Aniline Division,
Allied Chemical Corp. 509
National Polychemicals, Inc. 585
National Rosin Oil Products, Inc. 615
National Rubber Machinery Co. 526
National Standard Co. ..... —
Naugatuck Chemical Division of
U. S. Rubber Co. 510, 511
Neville Chemical Co. 499
New Jersey Zinc Co., The 493

O

Ozone Research and Equipment Corp. ... 522

P

Pennsylvania Industrial Chemical Corp. .. —
Phillips Chemical Co. 490, 503
Polymer Corp., The ..... —
Polymer Corp., Ltd. ..... —

R

Rand Rubber Co. ..... —
Rare Metal Products Co. 613
Richardson, Sid, Carbon Co. 618
Richardson Scale Co. 524
Roebling's, John A., Sons Corp. 565
Royle, John, & Sons 522
Rubber Corp. of America 605
Rubber Regenerating Co., Ltd., The 591

S

St. Joseph Lead Co. ..... —
Sargent's C. G., Sons Corp. ..... —
Schulman, A., Inc. ..... Third Cover
Scott Testers, Inc. 588
Shaw, Francis, & Co., Ltd. 506
Shell Chemical Corp.,
Synthetic Rubber Sales Division 501
Shore Instrument & Manufacturing Co.,
Inc., The 613
Silicones Division, Union Carbide Corp. ... —
South Texas Tire Test Fleet, Inc. 605
Southeastern Clay Co. 601
Southern Clays, Inc. ..... —
Spadone Machine Co., Inc. 512
Spencer Products Co., Inc. ..... —
Stamford Rubber Supply Co., The 520
Sun Oil Co. 583

T

Taylor Instrument Cos. ..... —
Taylor, Stiles & Co. ..... —
Testing Machines, Inc. 570
Texas-U. S. Chemical Co. ..... Insert 528, 529
Thiokol Chemical Corp. ..... —
Titanium Pigment Corp. 504
Torrington Co., The ..... —
Turner Halsey Co. ..... —

U

Union Carbide Chemicals Co.,
Division of Union Carbide Corp. ..... —
Union Carbide Corp.:
Silicones Division ..... —
Union Carbide Chemicals Division ..... —
United Carbon Co., Inc. ..... Insert 507, 508
United Engineering & Foundry Co. ..... —
United Rubber Machinery Exchange 613
U. S. Rubber Reclaiming Co., Inc. 512
Universal Oil Products Co. 525

V

Vanderbilt, R. T., Co., Inc. 532
Velsicol Chemical Corp. ..... —

W

Wade, L. C., Co., Inc. ..... —
Wellington Sears Co. 599
Wellman Co. ..... —
White, J. J., Products Co. ..... —
Williams, C. K., & Co., Inc. ..... —
Williams, George A., & Son ..... —
Witco Chemical Co., Inc. 593
Wood, R. D., Co. ..... —

...teamwork

Successful calf roping requires teamwork between man and horse. A successful business requires teamwork between supplier and customer.

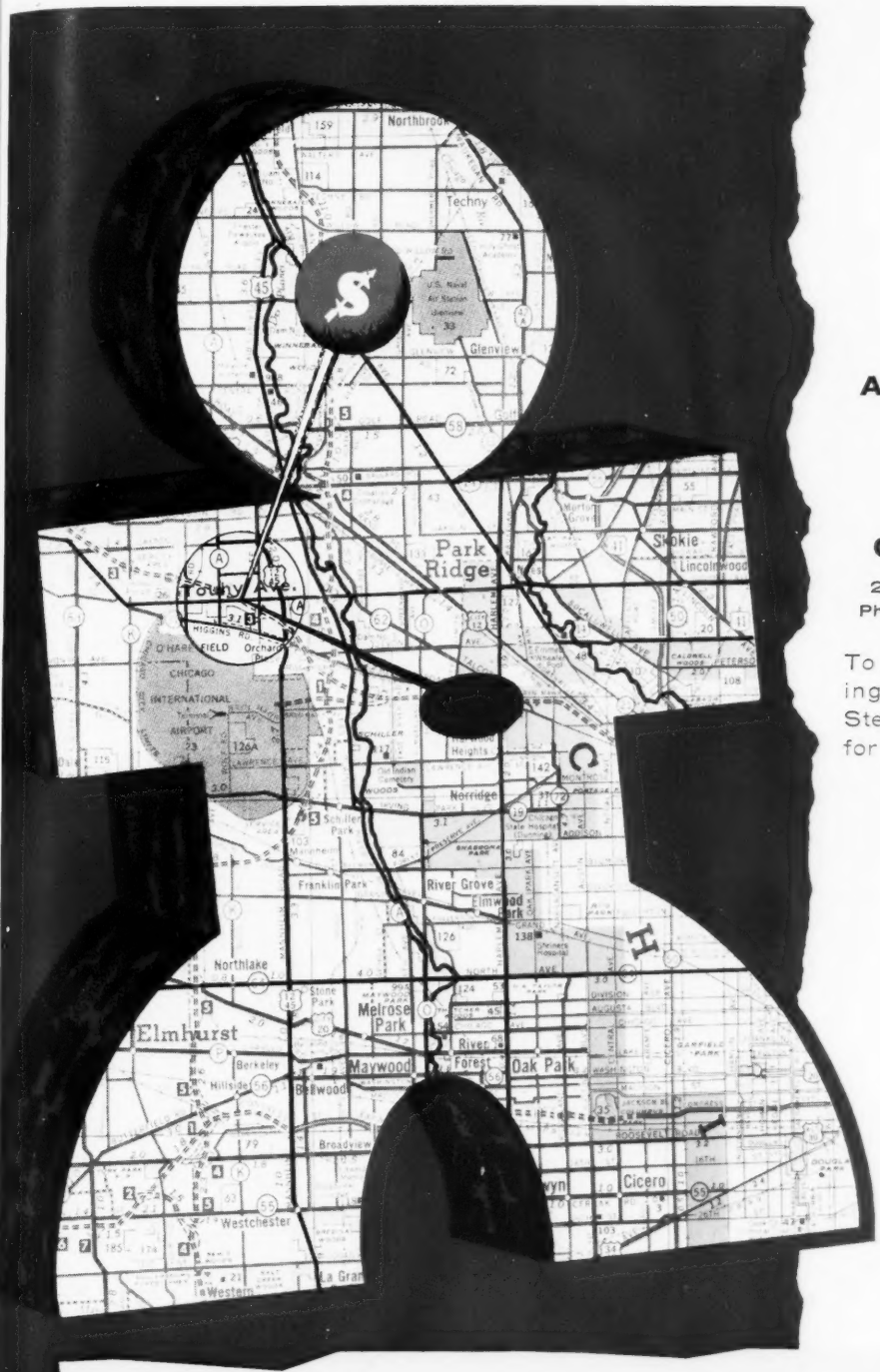
The users of ***TEXAS CHANNEL BLACKS*** are assured of teamwork — not only through the quality of the blacks but also the extra quality they impart to finished product when used alone or in blends.

TEXAS
CHANNEL BLACKS
®

Sid Richardson
CARBON CO.

FORT WORTH, TEXAS

GENERAL SALES OFFICES
EVANS BUILDING
AKRON 8, OHIO



A. Schulman Inc.

Announces

a NEW

Chicago Office

2947-51 W. Touhy Ave.
Phone: Rogers Park 1-5615

To better serve the growing Midwest. Call Jim Steiner, Sales Manager, for your needs in

Rubber
and
Plastics

A. Schulman Inc.

790 East Tallmadge Ave.
Akron 9, Ohio

14th and Converse
East St. Louis, Illinois

460 Park Avenue
New York 22, New York

Bodekerstrasse No. 5
Hanover, Germany

738 Statler Building
Boston 16, Massachusetts

3350 Wilshire Boulevard
Los Angeles 17, California
Texaco Bldg.

Ibex House,
Minories,
London E. C. 3, England

Our 30th Year

NEW CABOT offices . . . . . for the West Coast

718 Texaco Building
3350 Wilshire Boulevard
Los Angeles 5, California
Telephone: DUnkirk 2-7333

A major step in a continuing program not only to provide you with the best possible products – but also with the best possible service.

• *For customers in the Bay Area, stocks of carbon black will be maintained in San Francisco for less-carload or emergency shipments. For this service, please call* EXbrook 7-5120.

Manufacturers of the most complete line of carbon blacks • CAB-O-SIL® colloidal silica • CAB-O-LITE wollastonite

CABOT®

GODFREY L. CABOT, INC.

77 FRANKLIN STREET, BOSTON 10, MASSACHUSETTS